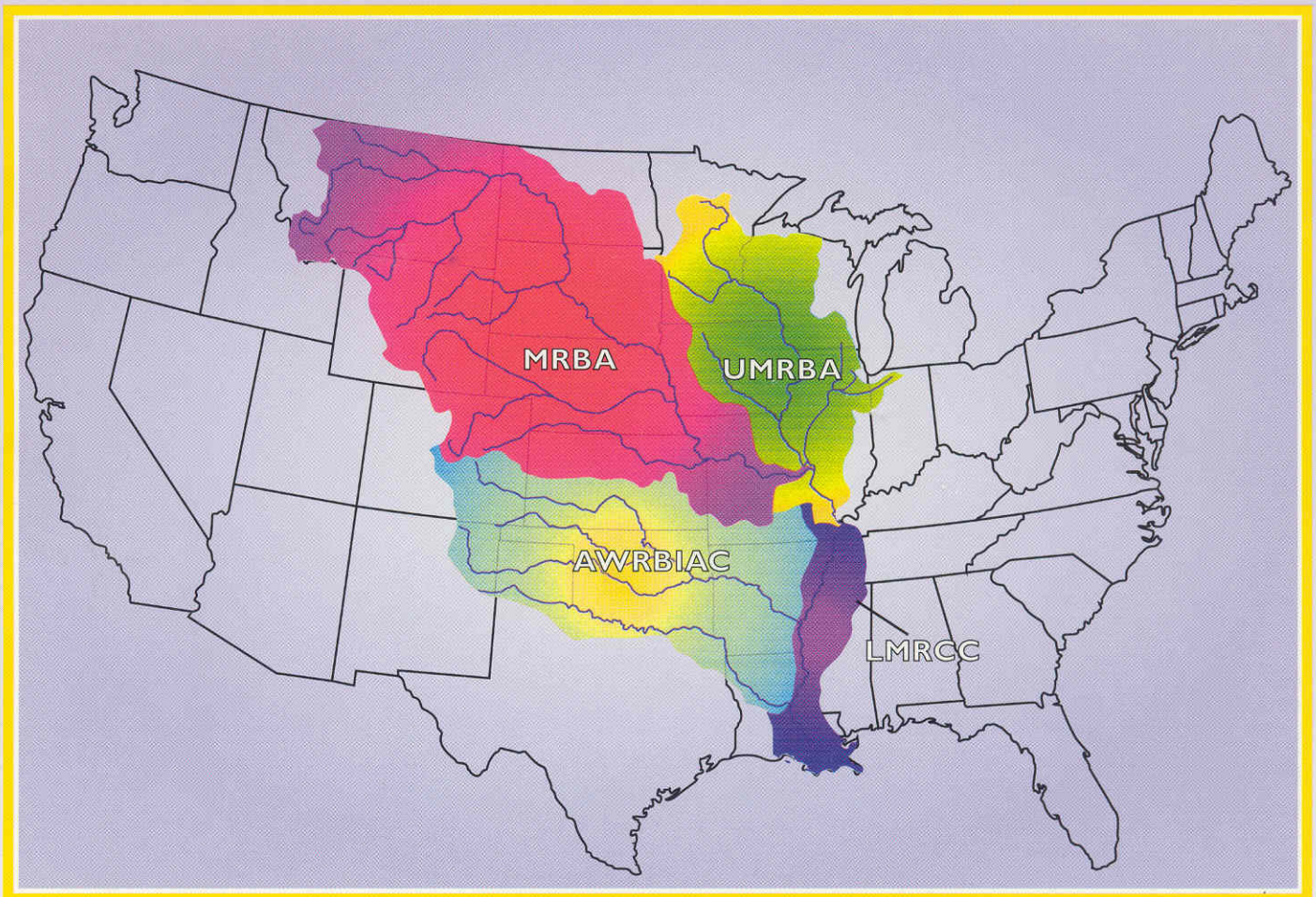
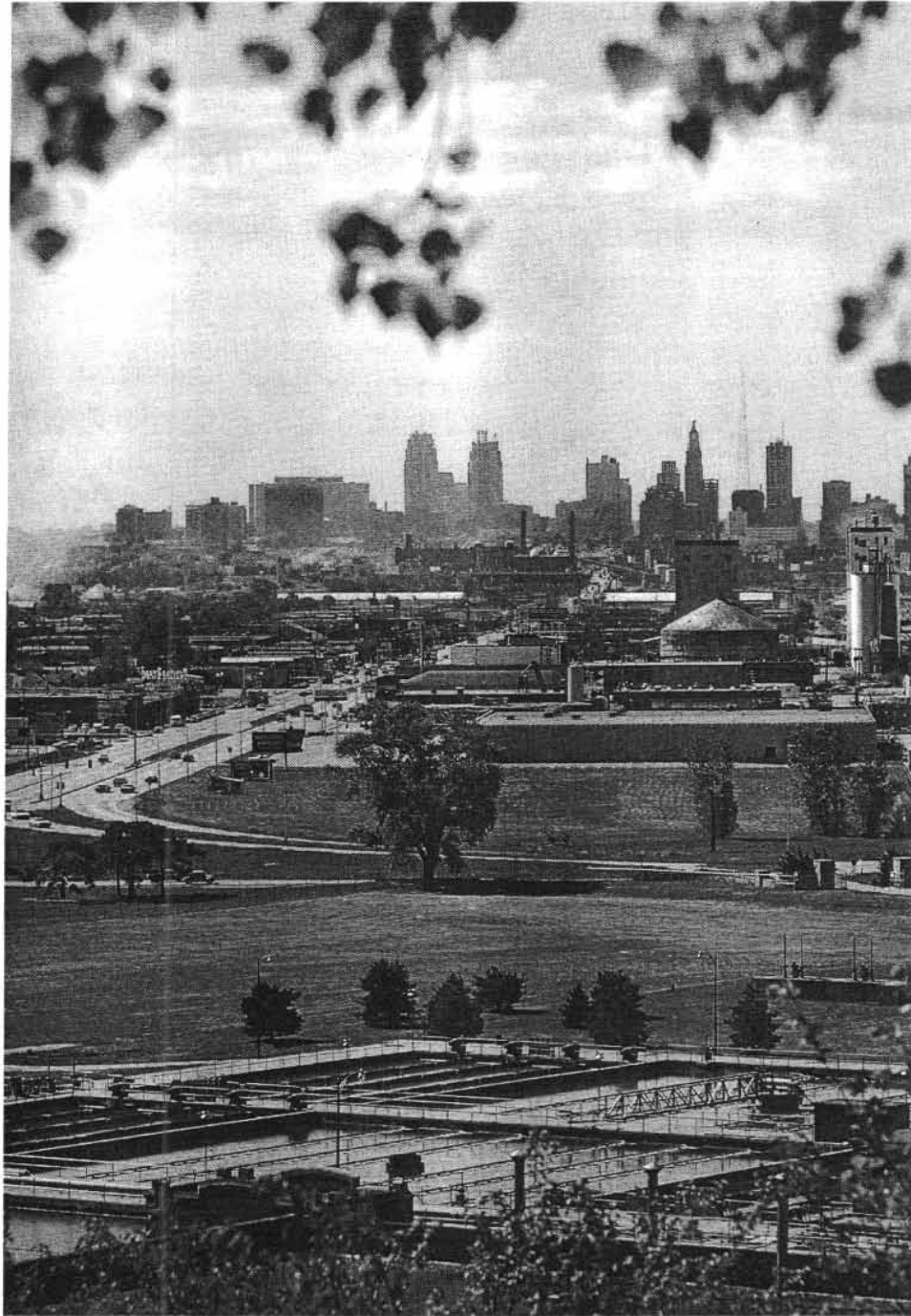


Water Resource Sharing

The Realities of Interstate Rivers





Great cities get their water from great rivers. Missouri's two largest cities—St. Louis and Kansas City—both take water from rivers. Pictured is the skyline of Kansas City with the Kansas City Municipal Water Plant in the foreground. Photo by Jerry D. Vineyard.

Missouri State Water Plan Series Volume VI

Water Resource Sharing

The Realities of Interstate Rivers

by
Jerry D. Vineyard

1997



MISSOURI DEPARTMENT OF NATURAL RESOURCES

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KEYTOACRONYMS

AOP - Annual Operating Plan (for the Missouri River)

AWRBIAC - Arkansas-White-Red Inter-Agency Committee

BOR - U.S. Bureau of Reclamation

CCWWC - Clarence Cannon Wholesale Water Commission

COE - U.S. Army Corps of Engineers

DGLS - Division of Geology and Land Survey (of DNR)

DNR - Missouri Department of Natural Resources

DEIS - Draft Environmental Impact Statement

EIS - Environmental Impact Statement

EMP - Environmental Management Program

EMTC - Environmental Management Technical Center

EPA - U.S. Environmental Protection Agency

ESA - Endangered Species Act

F&WS - U.S. Fish and Wildlife Service

IWR - Indian water rights

LMRCC - Lower Mississippi River Conservation Committee

LTRMP - Long-Term Resources Monitoring Project

MAF - Million acre-feet (1 acre-foot = 327,700 gallons)

MM - Master Manual (short for Master Water Control Manual for the Missouri River)

MRBA - Missouri River Basin Association

UMRBA - Upper Mississippi River Basin Association

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PREFACE

MISSOURI STATE WATER PLAN TECHNICAL VOLUME SERIES

The Missouri Department of Natural Resources State Water Plan Technical Volume Series is part of a comprehensive state water resource plan. This portion is designed to provide basic scientific and background information on the water resources of the state. The information in these technical volumes will provide a firm foundation for addressing present and future water resource needs and issues. Each volume in the series deals with a specific water resource component.

Volume I

The *Surface Water Resources of Missouri* contains a basin-by-basin assessment of Missouri's surface water resources. It discusses the effects of climate, geology and other factors on the hydrologic characteristics of major lakes, streams and rivers. It also assesses surface-water availability and development in the state.

Volume II

The *Groundwater Resources of Missouri* presents information on the availability and natural quality of groundwater throughout the state. It focuses on Missouri's seven groundwater provinces and includes their geology, hydrogeology, areal extent, general water quality, and potential for con-

tamination. Aquifer storage estimates are given for each aquifer and county. The report also reviews the different types of water-supply wells in use and how water well construction techniques vary between areas and aquifers.

Volume III

Missouri Water Quality Assessment focuses on the current quality of Missouri surface water and ground-water. The volume looks at chemical, bacteriological and radiological water-quality, and natural and man-induced water-quality changes.

Volume IV

The *Water Use of Missouri* describes how Missouri is presently using its surface-water and groundwater resources. The report covers private and public water supplies, industrial and agricultural water uses, and water use for electrical power production, navigation, recreation, fish and wildlife.

Volume V

Hydrologic Extremes in Missouri: Flood and Drought provides basic information about flooding and drought specific to Missouri. A historical perspective is given, as well as information that can be used in planning for hydrologic extremes. It also describes concepts and defines terminology helpful in understanding flood and drought.

Volume VI

Water Resource Sharing - The Realities of Interstate Rivers presents Missouri's views concerning interstate rivers. Because of its location, Missouri can be greatly affected by activities and water policy in the upper basin states of the Missouri and Mississippi river basins. Missouri policy can also affect downstream states on the Mississippi, Arkansas and White rivers. Many serious

issues affecting these rivers have less to do with their physical characteristics than with political, economic and social trends.

Volume VII

Missouri Water Law provides an overview of the laws that affect the protection and use of Missouri's water resources. It supplies reference information about existing doctrines, statutes and case law.

ACKNOWLEDGMENTS

Several people read the manuscript before publication, including Ron Kucera, Jim Williams, Steve McIntosh, Jim Vandike and John Drew. Many helpful suggestions were made and numerous errors corrected. However, any errors and/or omissions remain the responsibility of the author.

Dwight Weaver edited the manuscript, and Susan Dunn did the illustrations and prepared the manuscript for publication. Sharon Hankins prepared the typescript.

INTRODUCTION

Missouri—the belt buckle of the nation—occupies strategic ground watered by America's greatest river system, the Mississippi River and its tributaries. The Mississippi, the Missouri, and the White rivers bring into the state enormous flows of water that must be shared with 19 other states. Missouri's fortuitous location in this well-watered landscape brings benefits and responsibilities far beyond those of states whose waters rise within their own borders.

Missouri is the last state to share the flow of both the upper Mississippi and Missouri rivers, but it is the first to use the water of the lower Mississippi. The White River flows from Arkansas into Missouri, then back into Arkansas. While it is in Missouri, the flow is impounded in lakes Table Rock, Taneycomo, and Bull Shoals. Lakes Norfolk and Clearwater are on tributaries of the White. A small part of southwestern Missouri drains into the Arkansas River, giving Missourians the first opportunity to use the water.

Missouri is both an upstream and a downstream state, which conveys great privilege and heavy responsibility. As a downstream state, we vigorously defend our right to use a fair share of water that flows into Missouri or along its borders. At the same time, we are obligated to use the water wisely and efficiently, and return as much of it as possible—in as good condition as possible—for the sequential uses of states downstream from Missouri.

The ultimate destination of the Mississippi River is the Gulf of Mexico, where its fresh, sediment- and nutrient-laden waters nourish marine fisheries

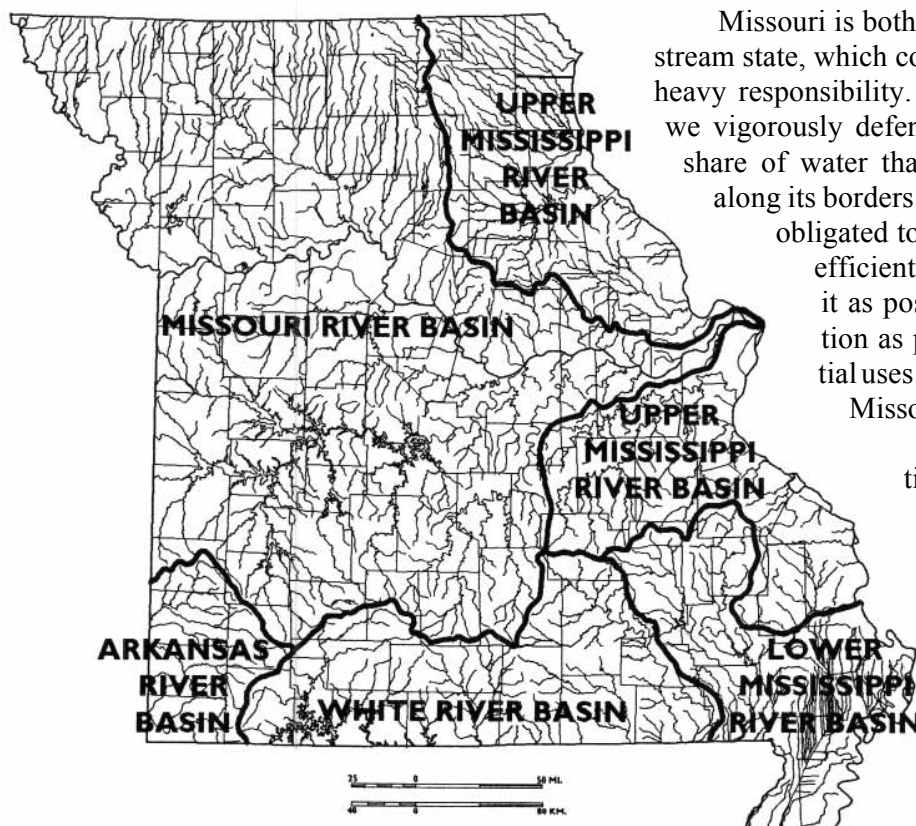


Figure 1. Missouri is part of five principal river basins.

and the shoreline of the Mississippi Delta. Throughout their courses, rivers support an ecosystem that relies on water to sustain itself. That ecosystem also supports a

complex human civilization with a growing population that continues to change the landscape at rates that may exceed any in geological history.

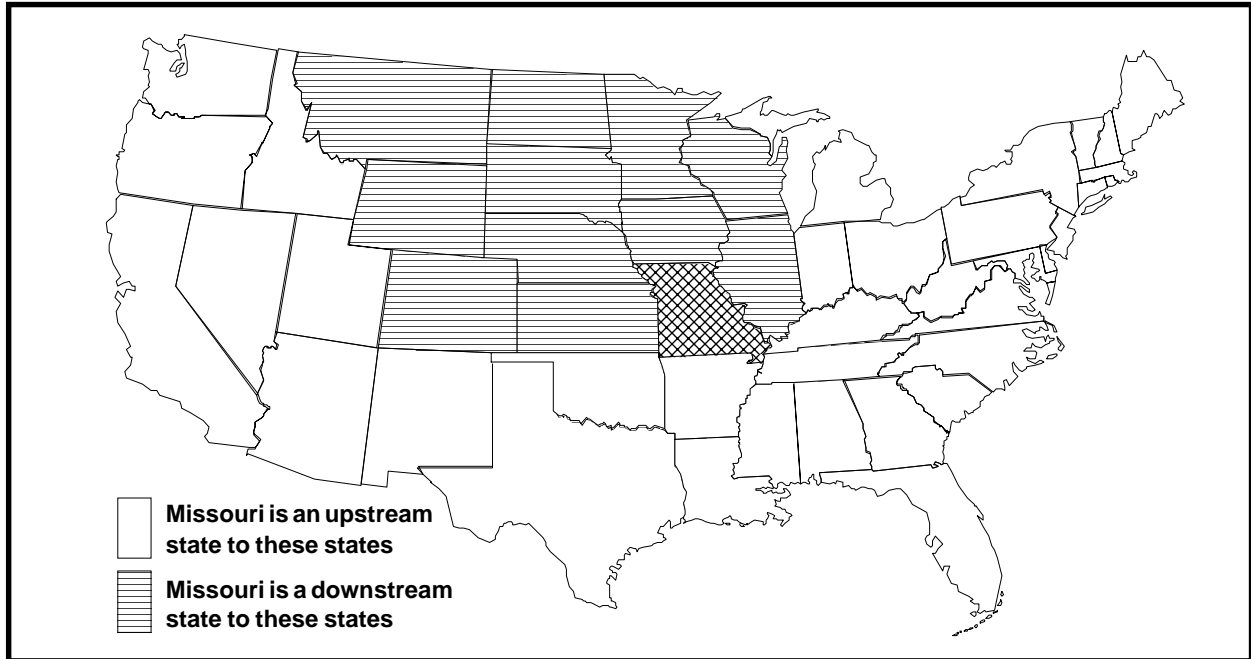


Figure 2. Upstream/downstream; Missouri is both.

Missouri is a <i>DOWNSTREAM STATE</i> to	
Montana	Illinois
Wisconsin	Kansas
Minnesota	Iowa
South Dakota	Colorado
North Dakota	Nebraska
Wyoming	
Missouri is an <i>UPSTREAM STATE</i> to	
Arkansas	Mississippi
Louisiana	Kentucky
Tennessee	Oklahoma

RIVER BASINS

Geography—which for the purposes of this document is the cultural and physical landscape developed upon the geological framework of North America—determines the distribution and quantity of water resources available to political entities such as cities, states and Indian tribes. A river basin is the total land area drained by a river and all of its tributaries, to the watershed divides that separate one basin from another. It is customary to subdivide basins by tributary. For example, the Grand, Osage, Chariton, and Gasconade watersheds are sub-basins of the Missouri River basin.

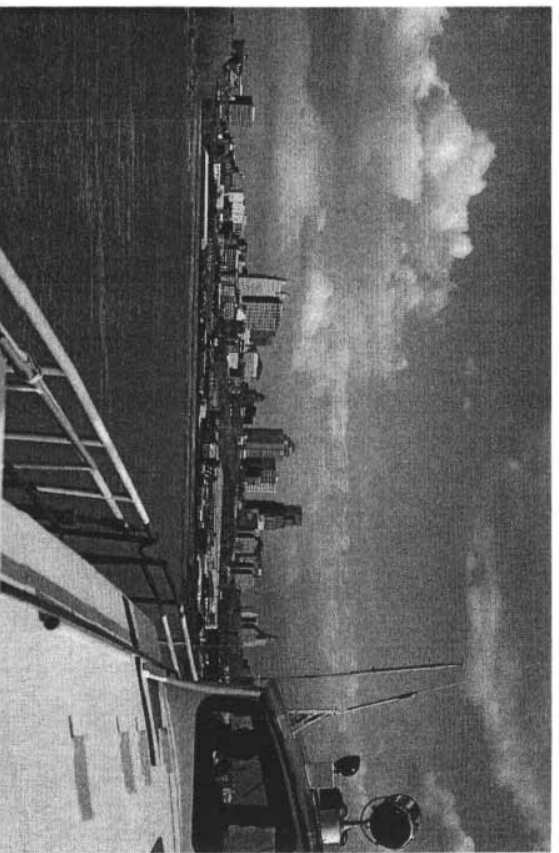
In the Mississippi basin, the Missouri, the White, and the Arkansas are sub-basins that drain the various parts of the state of Missouri. And, the Mississippi itself is subdivided for convenience into the Upper Mississippi and the Lower Mississippi.

Rivers are used as political boundaries, as in the

case of Missouri and Illinois, but basin boundaries—or divides—are not generally used as political boundaries. Therefore, river basins have no respect for state lines. Reality requires, though, that river basin boundaries be recognized in dealing with interstate water issues.

In calculating the water resources to which the people of Missouri have a right to use and enjoy, we use river basins as convenient planning units. It is in this context that Missouri lays claim to a fair share of water that flows—for example—from the hot springs of Yellowstone National Park, into Yellowstone River, which flows into the Missouri River near Williston, North Dakota. In like manner, Missourians share part of the waters of Lake Itasca, source of the Mississippi River.

Figure 3. Rivers make good natural boundaries. A riverboat navigating the approximate Missouri-Kansas boundary approaches Kansas City from the North. Photo by Jerry D. Vineyard.



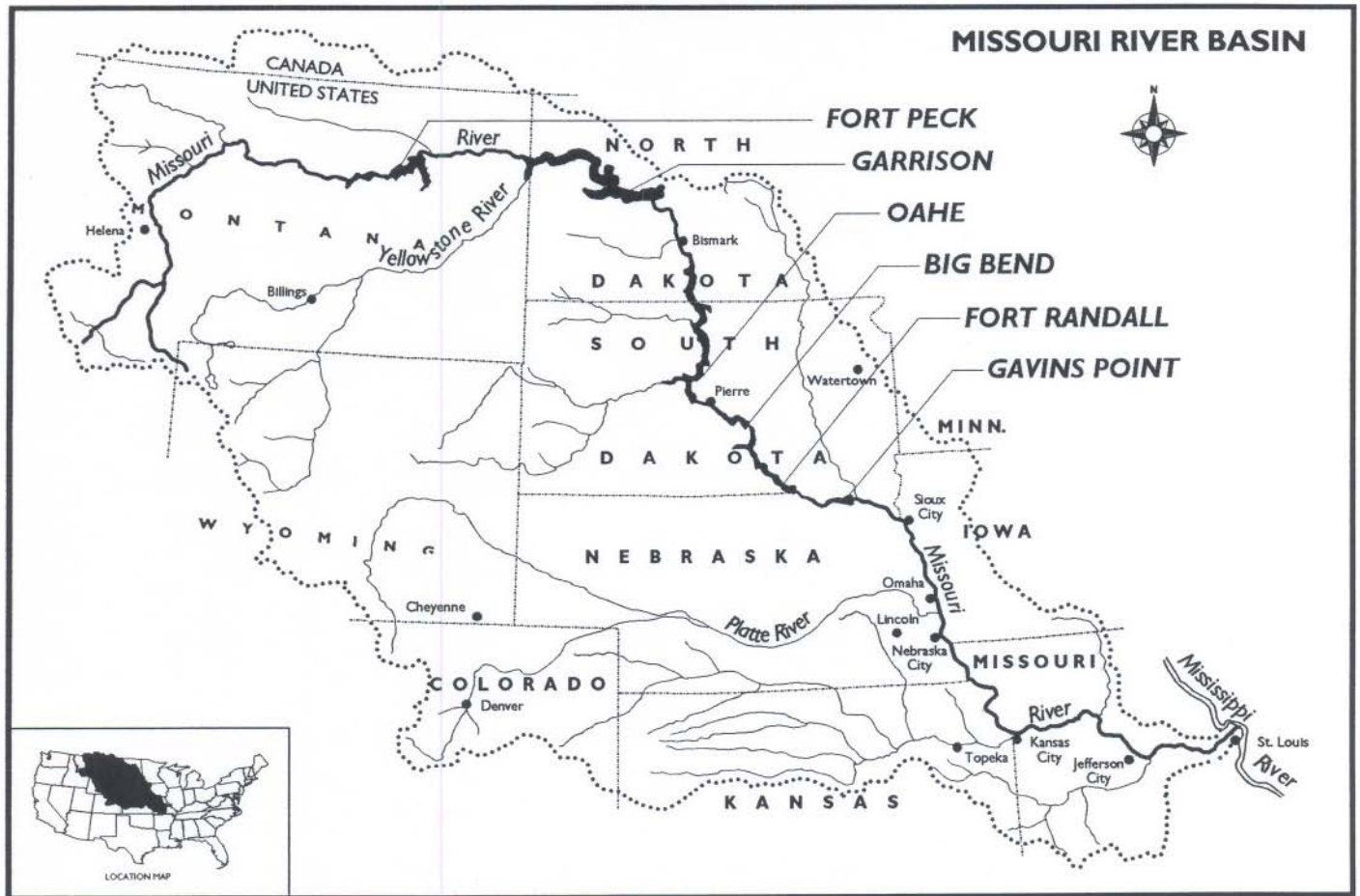


Figure 4. Missouri River Basin. Names in heavy black type are the main-stem dams that the Corps of Engineers use to control the flow of the Missouri River.



Figure 5. Upper Mississippi River Basin.

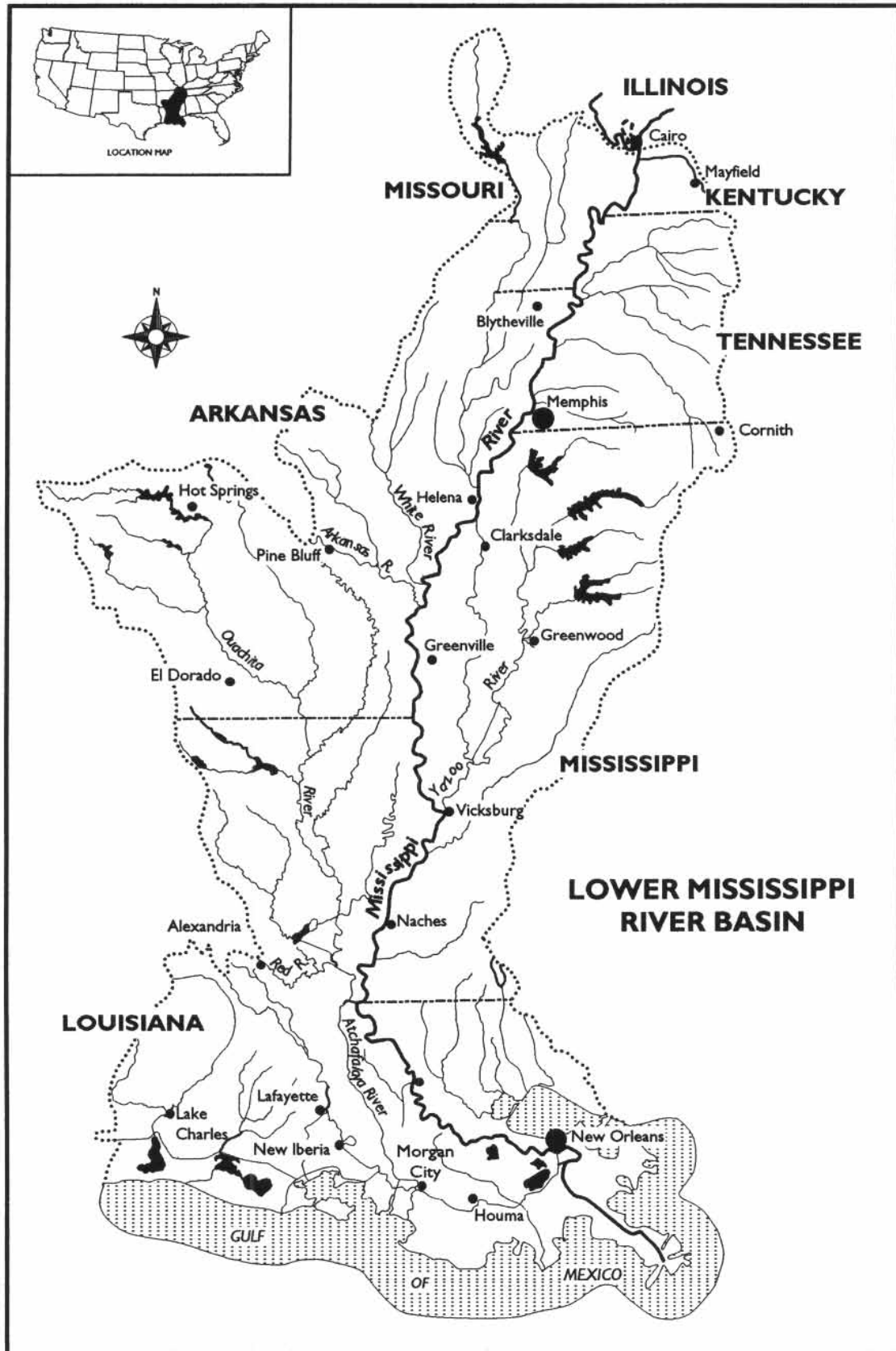


Figure 6. Lower Mississippi River Basin.

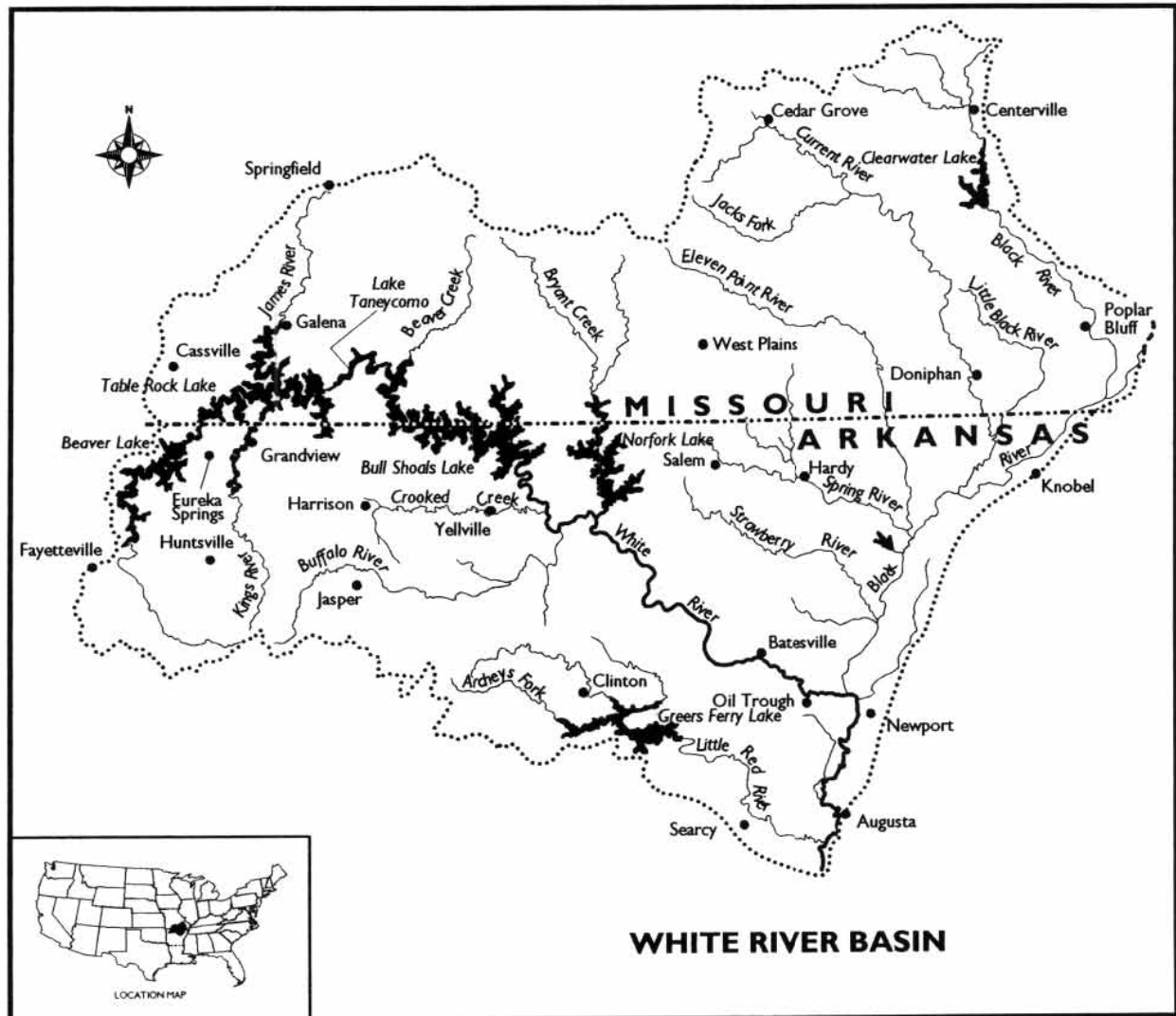


Figure 7. White River Basin.

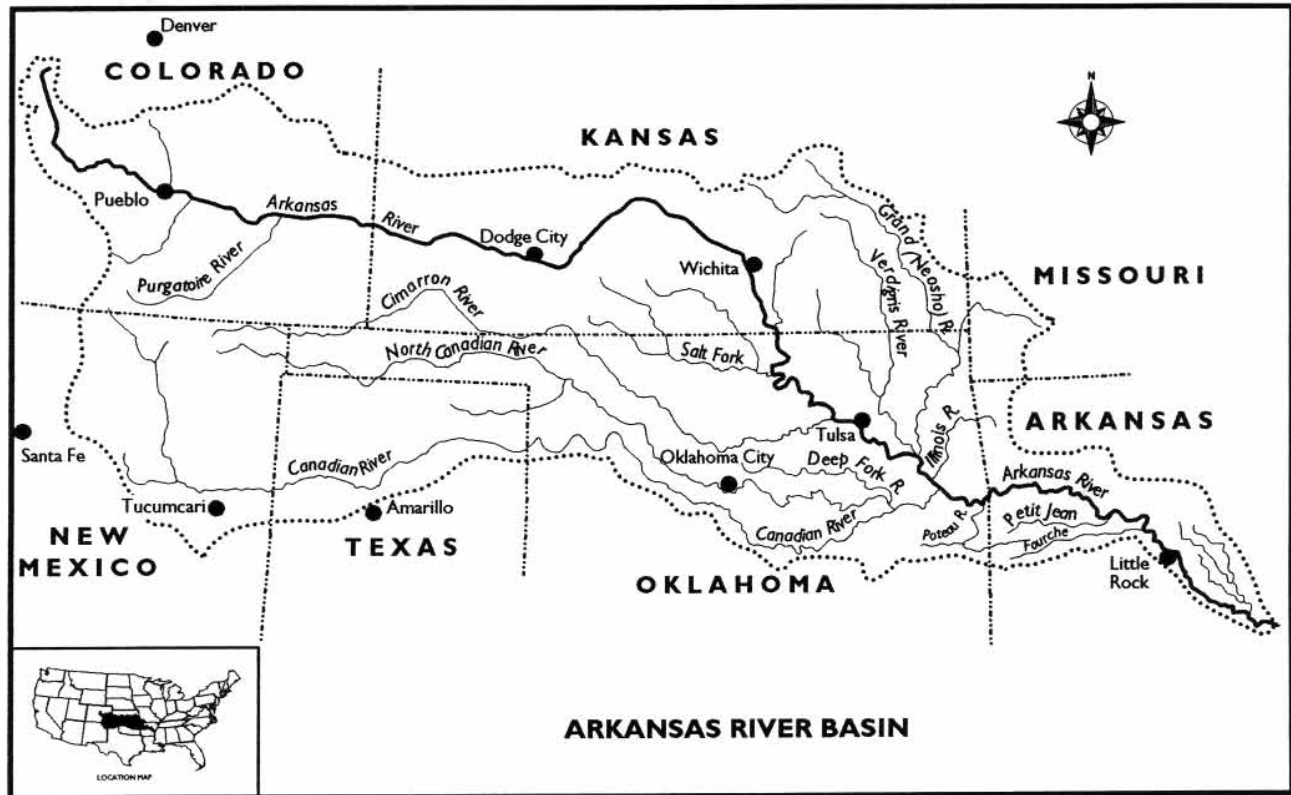


Figure 8. Arkansas River Basin.

RIVERMANAGEMENT

The U.S. Army Corps of Engineers (COE) and the U.S. Bureau of Reclamation (BOR) are the federal agencies with responsibilities for river management. The BOR is responsible for the upstream state (BOR does not operate in Missouri) tributaries of the Missouri River, while the COE has flood control, main stem operations, and administrative authority. For interstate rivers, the Corps is the primary authority.

The Corps has divided the country into management units known as Divisions and Districts. A Division is a major geographic area, with boundaries that generally follow drainage basin divides. However, Corps organization does not entirely follow river basin boundaries.

Within a Division there may be several Districts, which are to Divisions as tributaries are to major streams.

Currently, Missouri interfaces with three Corps Divisions and seven Districts (figure 9). Congress recently directed

the Corps to reduce the number of divisions while retaining current districts, as a cost-cutting measure.

Congress authorized the Corps of Engineers to complete comprehensive plans of development for 28 river basins, as noted in Sec. 909 of the Water Development Act of 1986. These authorizations began as early as 1928, and they are repeatedly cited as the Congressional authority for Corps of Engineers projects in the various river basins. Those authorizations that affect Missouri are shown in Table 1.

In addition to these comprehensive development plans, Congress also passed the controversial Flood Control Act of 1944 (widely known as the Pick-Sloan Plan) for construction of dams on the Missouri River. The Missouri River Bank Stabilization and Navigation Project, authorized by

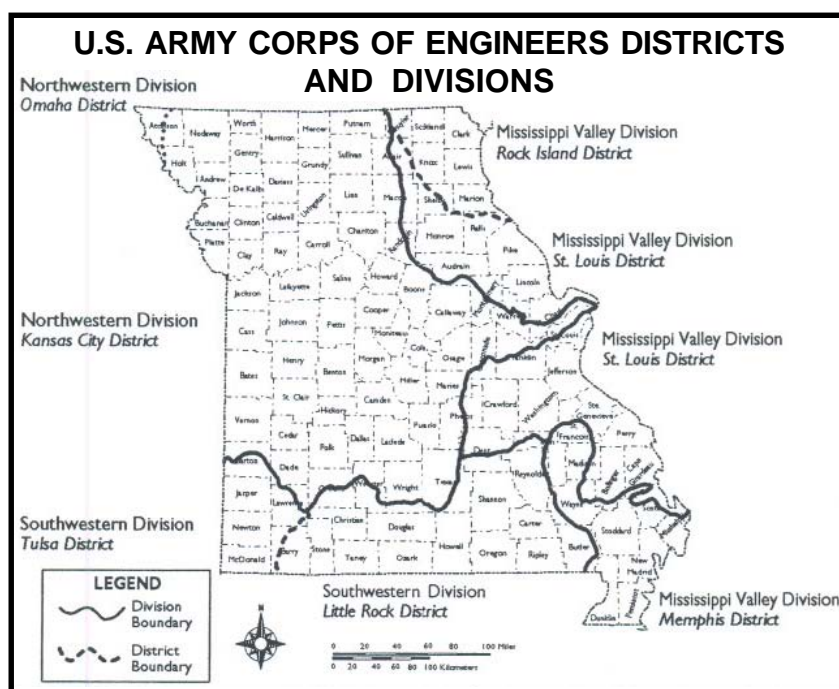


Figure 9. Corps of Engineers river management units.

Table 1. Congressional River Basin Acts

<i>Basin</i>	<i>Act of Congress</i>
Arkansas River Basin	June 28, 1938
Arkansas-Red River Basin	November 7, 1966
Mississippi River and Tributaries	May 15, 1928
Missouri River Basin	June 28, 1938
Upper Mississippi River Basin	June 28, 1938
White River Basin	June 28, 1938

Congress in the River and Harbor Act of 1945 and completed in 1981, directed the Corps to channelize the river below Gavins Point Dam for navigation. Today, the main-stem reservoirs and the navigation channel are operated as a system.

The Corps' ability to manage the flow of rivers and the utilization of their waters varies from basin to basin. For example, the Arkansas basin in Missouri has no COE dams, levees, or other facilities, so there is little to no control over the several tributary streams that flow from parts of southwestern Missouri.

The Missouri River, on the other hand, is rigidly controlled by the Corps' Reservoir Control Center in Omaha, Nebraska, where decisions are made on a daily basis in order to follow the provisions of the Pick-Sloan Plan (commonly-used term for the Flood Control Act of 1944, which authorized the Corps of Engineers and the Bureau of Reclamation to build a system of reservoirs on the main-stem Missouri River and its tributaries. This system was designed to provide benefits to the entire basin, in flood control, irrigation, water supply, hydropower, navigation, recreation, and fish and wildlife). In addition, the Corps maintains an extensive system of levees and water control structures that together form the 735-mile navigation channel from Sioux City, Iowa, to the mouth of the Missouri River near St. Charles, Missouri.

The Corps manages the Missouri River through a system of six main-stem reservoirs in Nebraska, the Dakotas, and Montana, plus a large number of dams on tributary streams.

Such a system can be extraordinarily effective in reducing flood losses and providing maintenance flows within the basin. Citing data from the most recent floods, the Missouri River system prevented \$4.5 billion in damages during the Great Flood of '93, and \$1.9 billion during flooding in 1995 (from Corps of Engineers, Missouri River Division, January 12, 1996).

There is a similar system of dams on the White River, operated by the Corps' District office in Little Rock, Arkansas (figure 11). Operation of the White River system has become more controversial in recent years because the various user groups are becoming more assertive, leading to a major effort on the part of the Corps of Engineers to develop a consensus-driven operating plan.

The Mississippi River, though it has a system of 27 dams, cannot be managed to the extent that the Missouri and White Rivers can, because the dams on the Mississippi are equipped with navigation locks and have little to no flood-control storage (figure 12). Navigation on the Mississippi, centerpiece of the nation's Inland Waterway System, moves some 100 million tons of commodities annually through the Port of St. Louis. River transportation on the Mississippi gives the Midwest access to international trade through the Port of New Orleans.

There are no dams at all on the lower Mississippi as it flows along the Missouri border, but there is an extensive system of federal levees in place, managed by the Corps of Engineers, to protect agricultural lands. In addition, the Corps' Memphis District has an

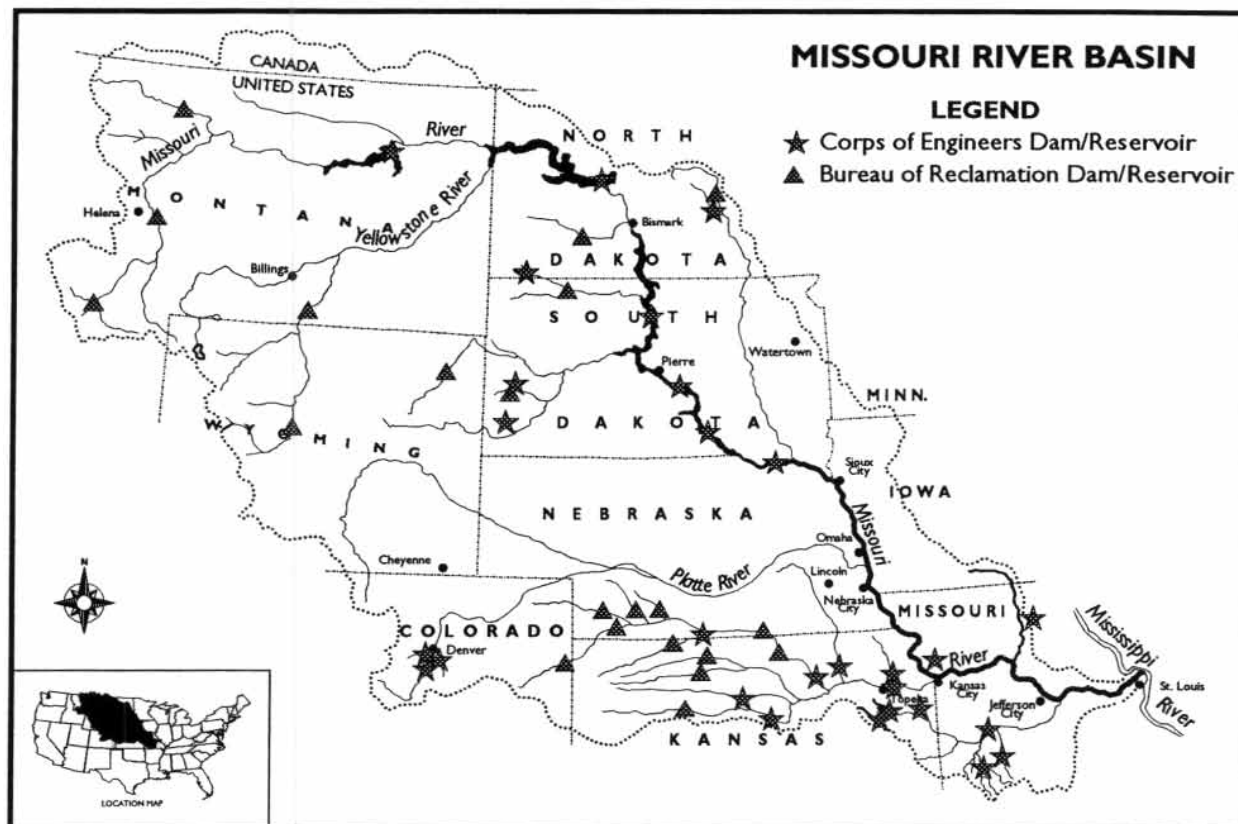


Figure 10. Corps of Engineers and Bureau of Reclamation dams and reservoirs in the Missouri River Basin.

emergency floodway plan that would sacrifice Missouri farmlands in what is known as the New Madrid Floodway, in the event of a major flood on the lower Mississippi. During such an event, if it became necessary to choose between flooding the urban area of Cairo, Illinois,

or the agricultural lands on the Missouri side, the Missouri levee would be explosively breached to relieve the pressure on the Illinois side (figure 14). A flood of this magnitude has never been experienced on the lower Mississippi, and one hopes that it never will.

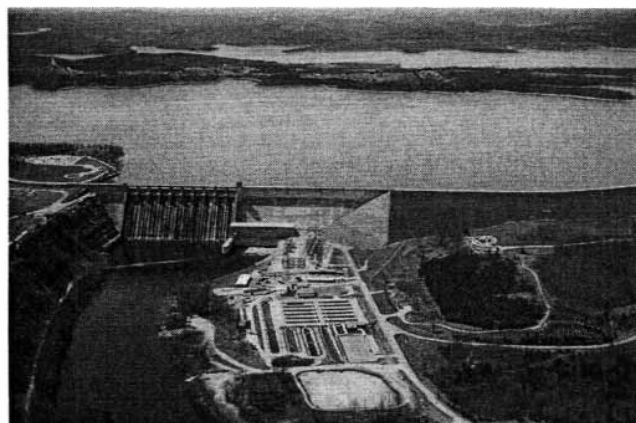


Figure 11. Table Rock Dam on the White River in Missouri, one of four main-stem dams that enable the Corps of Engineers to manage the White River. Photo from DGLS archives.

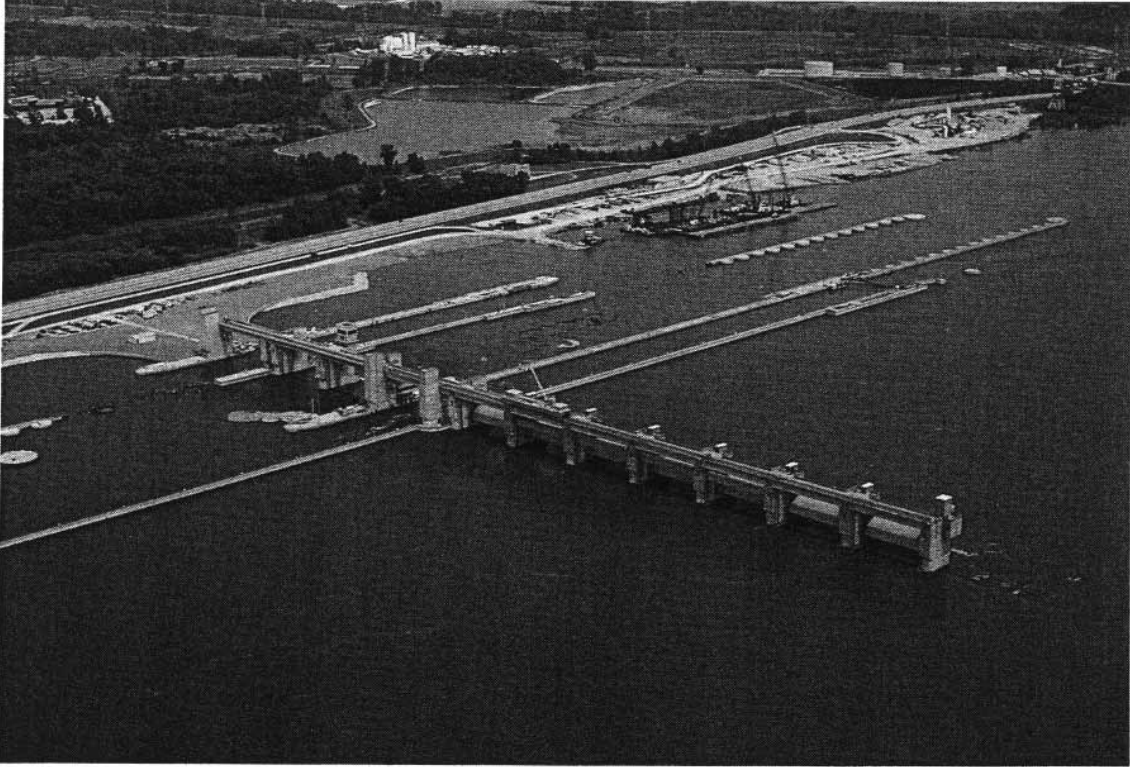


Figure 12. Lock and Dam 26, on the Mississippi River at Alton, Illinois, awash during the Great Flood of '93. In such situations, navigation shuts down above St. Louis, until the river returns within its banks. Photo by Jerry D. Vineyard.

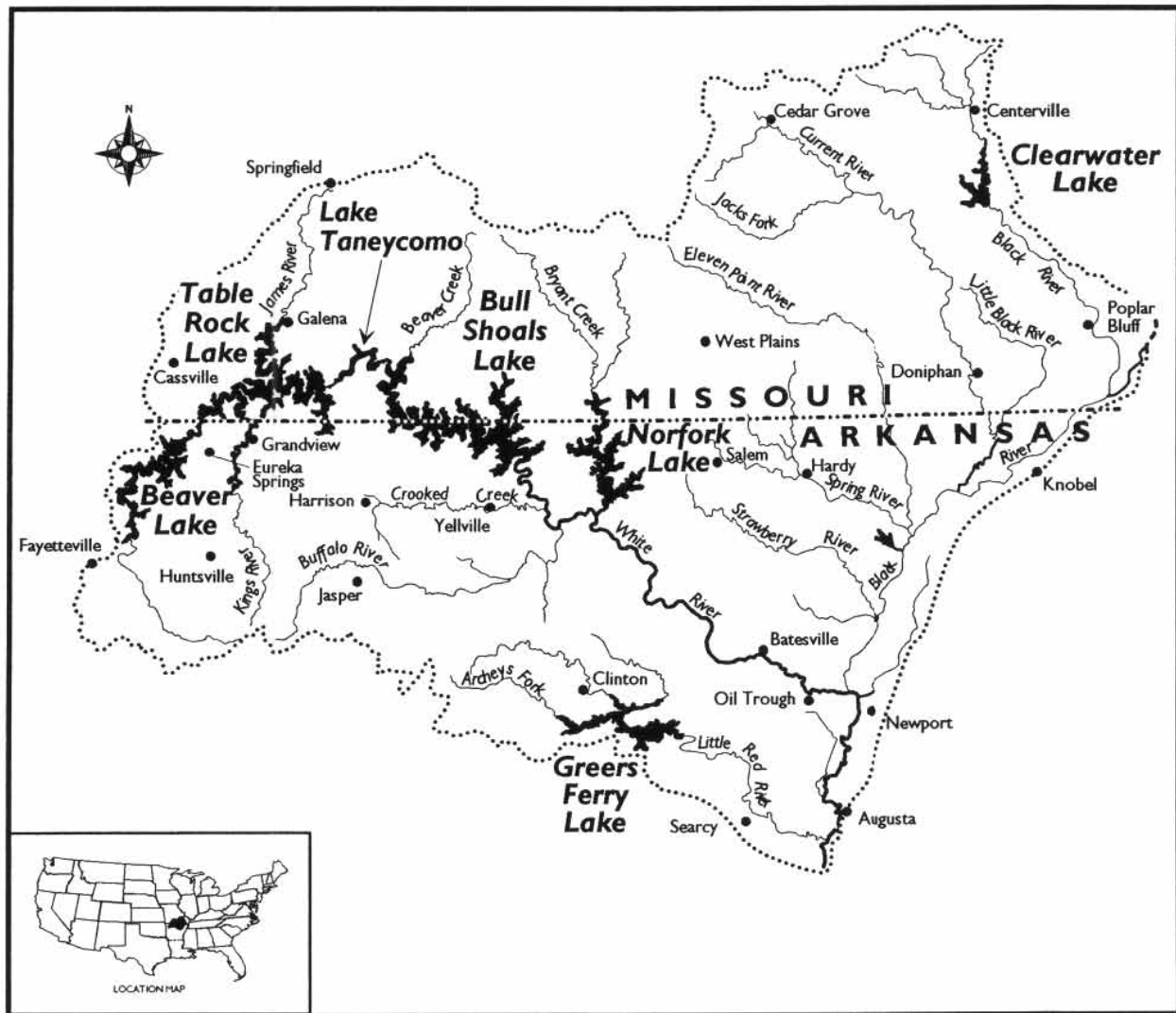


Figure 13. Corps of Engineers lakes (except privately-owned Lake Taneycomo) on the White River, Arkansas and Missouri.

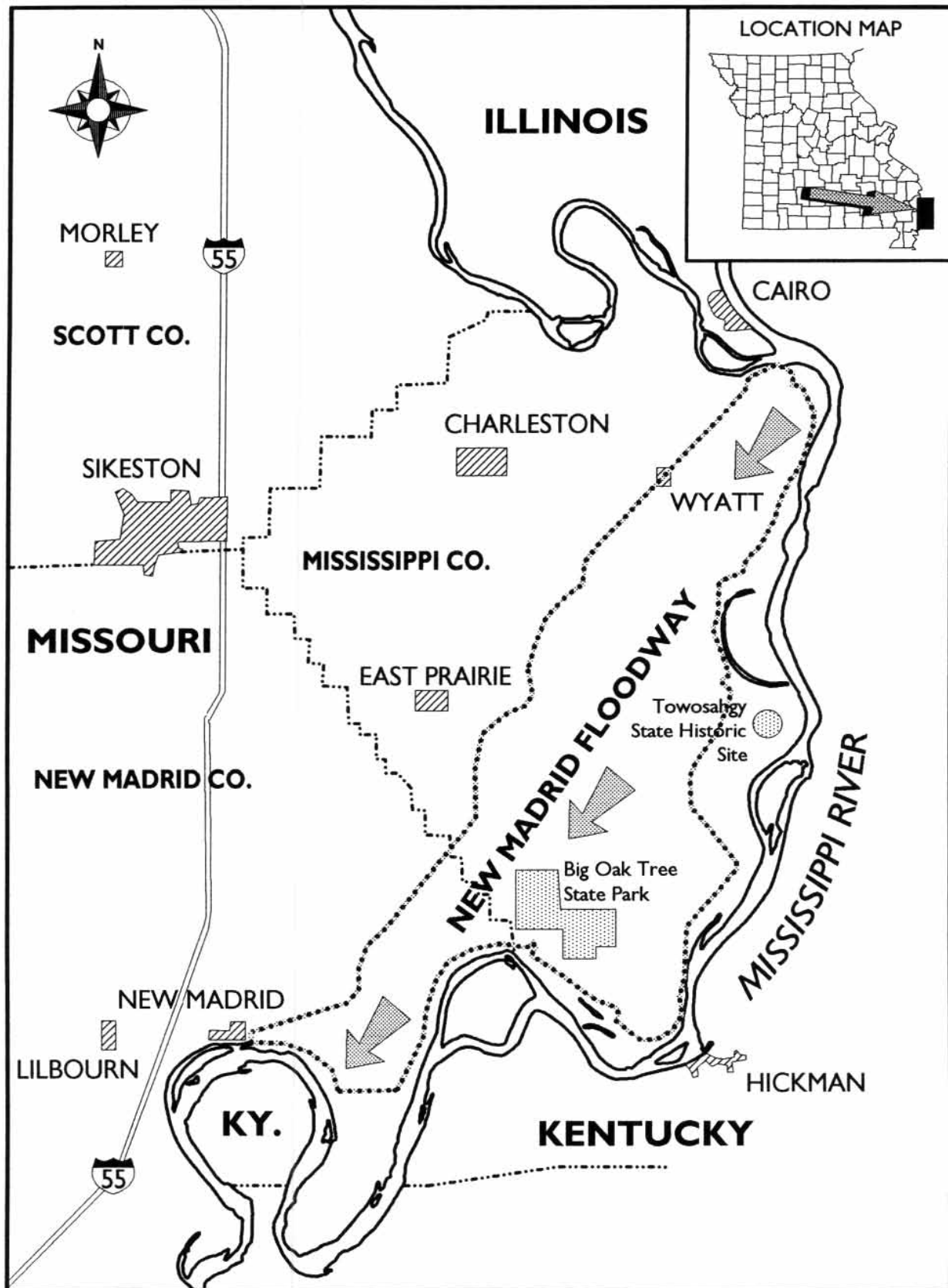


Figure 14. The New Madrid Floodway. Area enclosed by the heavy dotted line is the area subject to flooding should a levee be purposely breached. Arrows indicate direction of flow.

RIVERS AS POLITICAL BOUNDARIES

Throughout human history rivers have been used as political boundaries because they effectively divide land areas. The Mississippi River divides the U.S. into Eastern and Western parts, and forms the partial boundaries of 10 states. It forms the entire eastern boundary of Missouri—with the exception of a small section of the Iowa-Missouri border formed by the Des Moines River—with the adjoining states of Illinois, Kentucky, and Tennessee. The Missouri River forms the Nebraska- and part of the Kansas-Missouri boundary, while the Bootheel in southeastern Missouri is formed by the channel of the St. Francis River, separating parts of Missouri and Arkansas.

Unfortunately, river boundaries are seldom precise. Boundaries are usually drawn on the thalweg, or hydrologic middle of a river. Ideally, neighboring states own to the center of the river, but it seldom works out that way, and when it does, it rarely stays the same for very long.

Large rivers typically develop wide floodplains, built up over time by the ceaseless activity of the streams through flood and drought. Left alone, rivers produce meanders that follow the principles of hydraulics, propagating themselves through time in an endless cycle of erosion and deposition. Change is the norm—not the exception—which produces many problems when rivers are used as political boundaries.

Missouri became a state in 1821, so the boundaries at that time were set according to surveyed boundaries and the channels of rivers. The Missouri River did not become a boundary until the Platte Purchase of 1836. Since then, many changes have occurred, leaving parts of Missouri landlocked in Kan-

sas, some of Missouri on the Nebraska side, and some of Nebraska on the Missouri side of the river. On the eastern boundary, channel changes on the Mississippi have left the Missouri-Illinois, Missouri-Kentucky, and Missouri-Tennessee boundaries in considerable disarray.

When a river changes course dramatically, as it typically does during a flood, the result is called an avulsion. Perhaps the most spectacular avulsion happened when the Missouri River cut through the neck of a meander at St. Joseph, leaving St. Joseph's Rosecrans Memorial Airport stranded on the Kansas side (figure 16). Another major avulsion left a sizable chunk of Illinois—Kaskaskia Island—on the Missouri side (figure 17).

When avulsions occur, they do not change the political boundaries, which are determined by surveying instruments and legitimized by statute. This becomes extremely complicated because a landholder may have to deal with two or more taxing authorities who may not always agree on precisely where the boundary lies.

Numerous avulsions involving the Missouri-Nebraska boundary have created problems for many years. Recently, the two states began to negotiate resolution of the problems, which required the formation of an Interstate Boundary Commission and the passage of identical legislative language in both states. Negotiators worked out a solution, and the Missouri General Assembly passed it, but thus far the Nebraska legislature has failed to act, leaving the situation unresolved. If Nebraska fails to act by a certain time, the entire effort will fail and it will be necessary to start over.

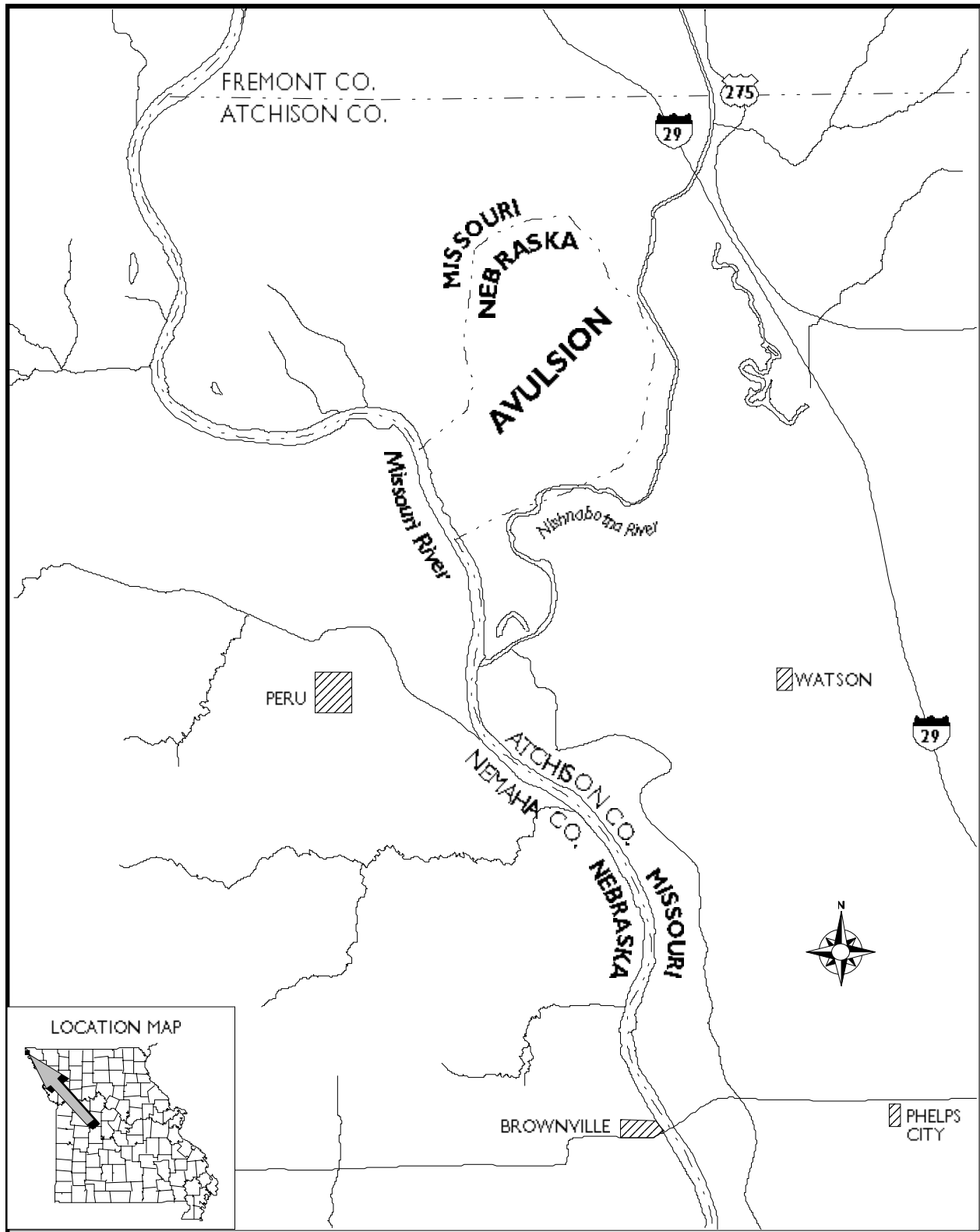


Figure 15. Missouri-Nebraska boundary along the Missouri River.

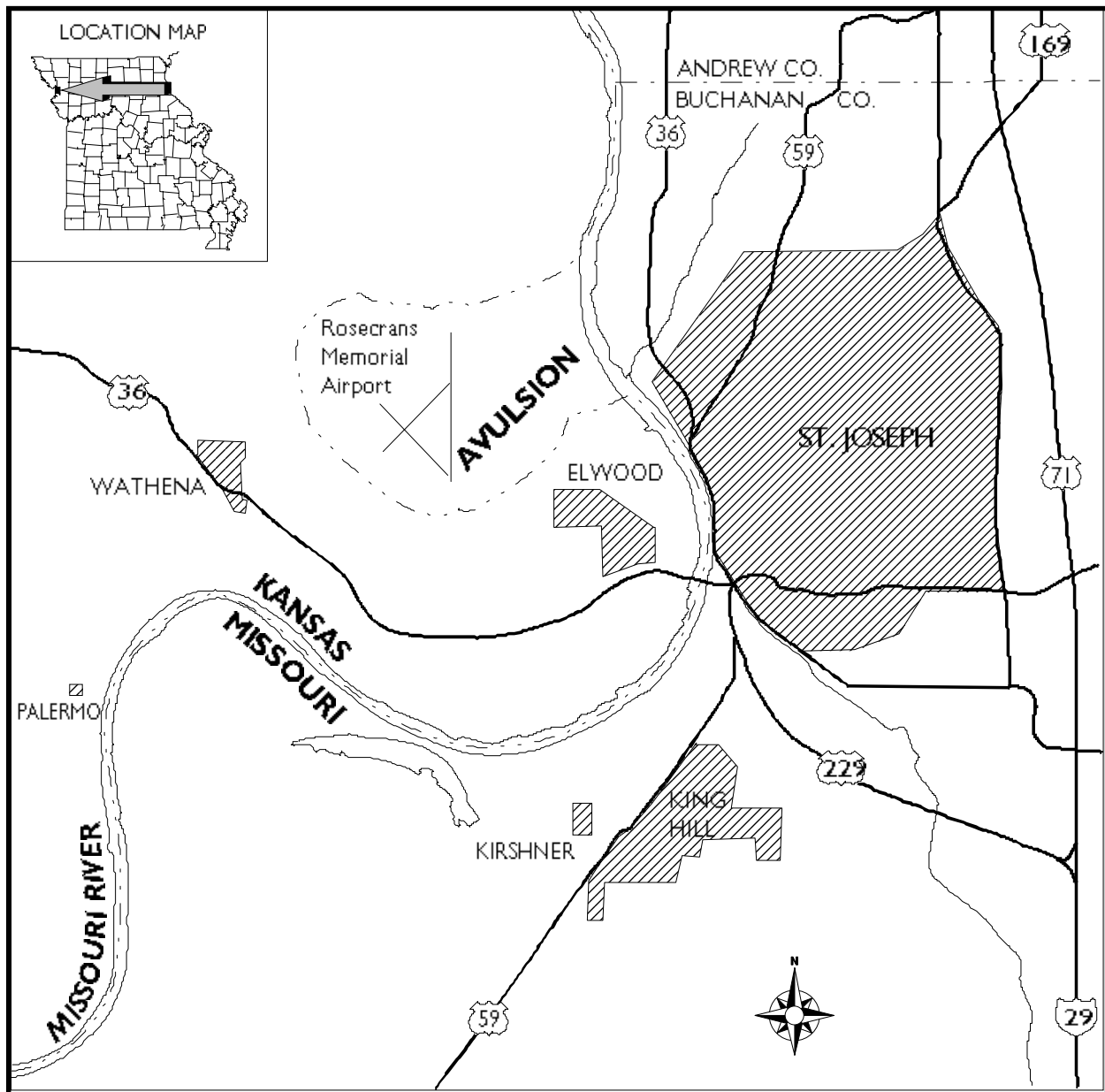


Figure 16. Missouri River avulsion leaves Rosecrans Airport stranded on the Kansas side of the river.

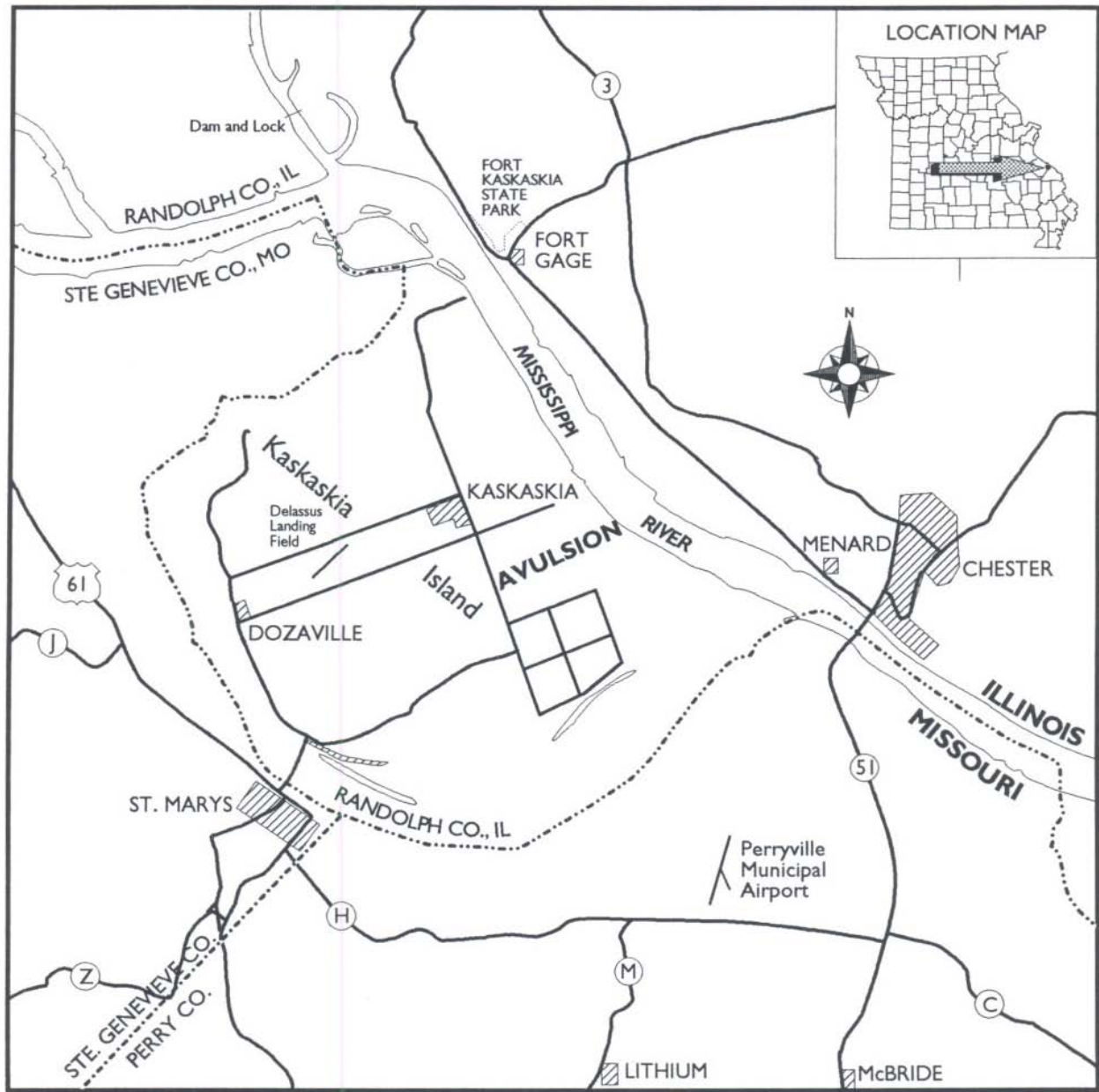


Figure 17. Kaskaskia Island residents pay taxes in Illinois, but they live on the Missouri side of the Mississippi River.

DIVERSIONS AND DEPLETIONS

When water is taken from a stream for whatever purpose, it is called a diversion. Water that is diverted from a source and is consumed, or does not return to the source, is called a depletion. Typically, water is diverted for purposes such as cooling water for fossil fuel and/or nuclear electrical generating plants, and returned after use. Some of this water is lost to evaporation, so there is a net depletion. In the Missouri River basin, for example, 25 million acre-feet (MAF) of water—on the average—flows into the system of main-stem reservoirs, while—on the average—only 20 MAF is released from Gavins Point Dam, the lowest controlling point on the system. Diversions for public water supply, industrial process water, evaporation from the reservoirs, and irrigation produce major depletions that contribute to the loss from the system. Future depletions will result in even less water coming down the river to Missouri.

Compared to the upper Missouri basin, there is relatively little depletion of the river as it passes through Missouri. The climate is more humid, there are no large reservoirs, there is comparatively little irrigation, and water diverted for power plant cooling is returned to the stream after use. Missouri public utilities

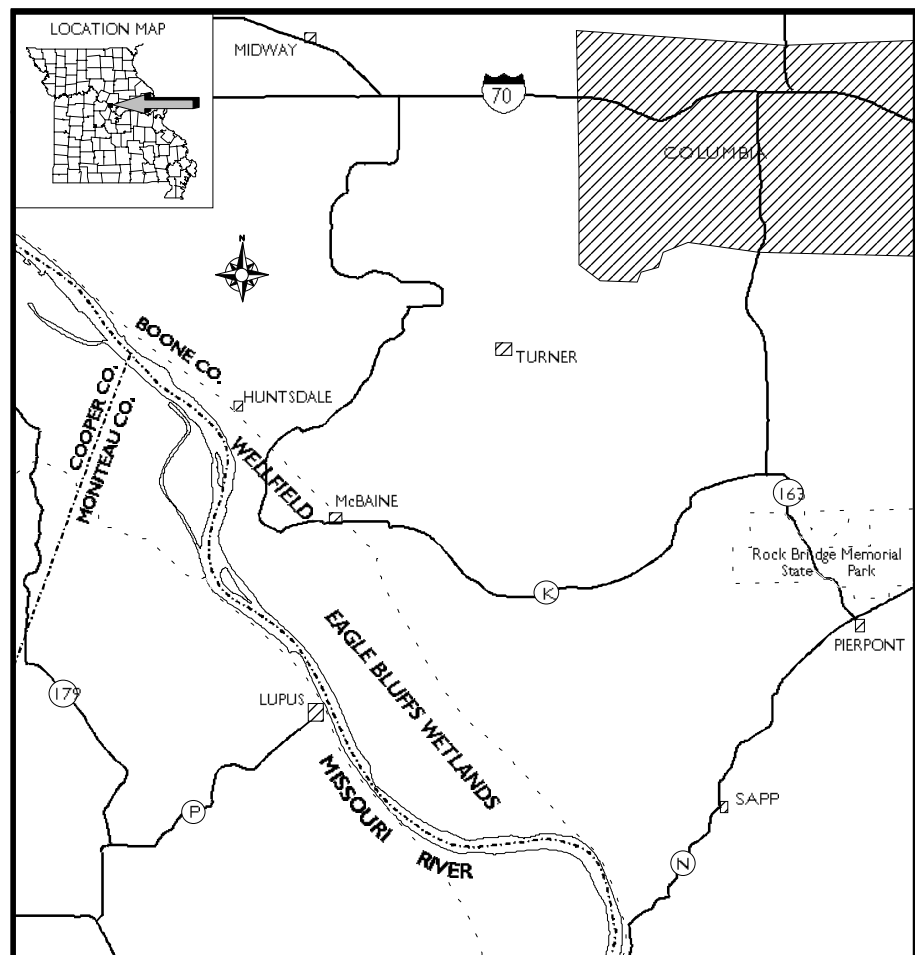


Figure 18. Eagle Bluffs/Columbia wellfield.

WATER CONSERVATION ETHIC

Earth is called the “Water Planet” because three quarters of its surface is covered by water. But only ONE PERCENT of that water is fresh water; the other 99 percent is unfit-to-drink salt water. The oceans contain most of the salt water, but some of it is held in landlocked lakes such as the Dead Sea in the Middle East, while mineralized groundwater such as that of northern and western Missouri makes another share of the world’s water supply unusable.

Groundwater becomes mineralized when it dissolves chemical constituents from the bedrock aquifers which contain it. Some groundwater is also thought to retain some of the original sea water that saturated the sediments from which the bedrock ultimately formed.

Water is essential for life; without it, humankind and the biosphere would die, leaving Earth barren and desolate.

Relying near-absolutely on only one percent of the world’s water supply (desalination technology is being used to a very limited extent), humankind has thus far

shown little concern for water conservation. Neglect and contamination have fouled rivers, lakes, and even the ocean; the development and widespread use of organic chemicals threatens groundwater worldwide; and the spectre of global warming looms over vast areas that could become deserts should global temperatures continue their rise.

To paraphrase an old saw, water conservation begins at home. We have a serious responsibility to use water conservatively, so that those downstream from us may share to the same extent that we share the rivers that flow into Missouri from upstream states. It is not OUR water; it belongs to the entire Earth, endlessly renewed through the hydrologic cycle.

As Earth’s population continues to grow at explosive rates, water will become more precious and less available. Competition for water is certain to increase throughout the world in the coming decades, absent widespread and affordable desalination technology.

do divert large amounts of Missouri River water for public water supply, but most of that is ultimately returned as the outfall from wastewater treatment plants. A shining example of how this works is the City of Columbia. Their water supply comes from a wellfield on the Missouri River floodplain, by pipeline to the city. After use, the water is returned to a wastewater treatment plant, the effluent from

which passes through a biological filter (wetland) before it returns to the Missouri River (figure 18).

Theoretically, every diversion results in some degree of depletion, so it is imperative that water be used in ways that minimize the losses to depletion. As we expect of those upstream, so do those downstream from Missouri expect attitudes of conservation.

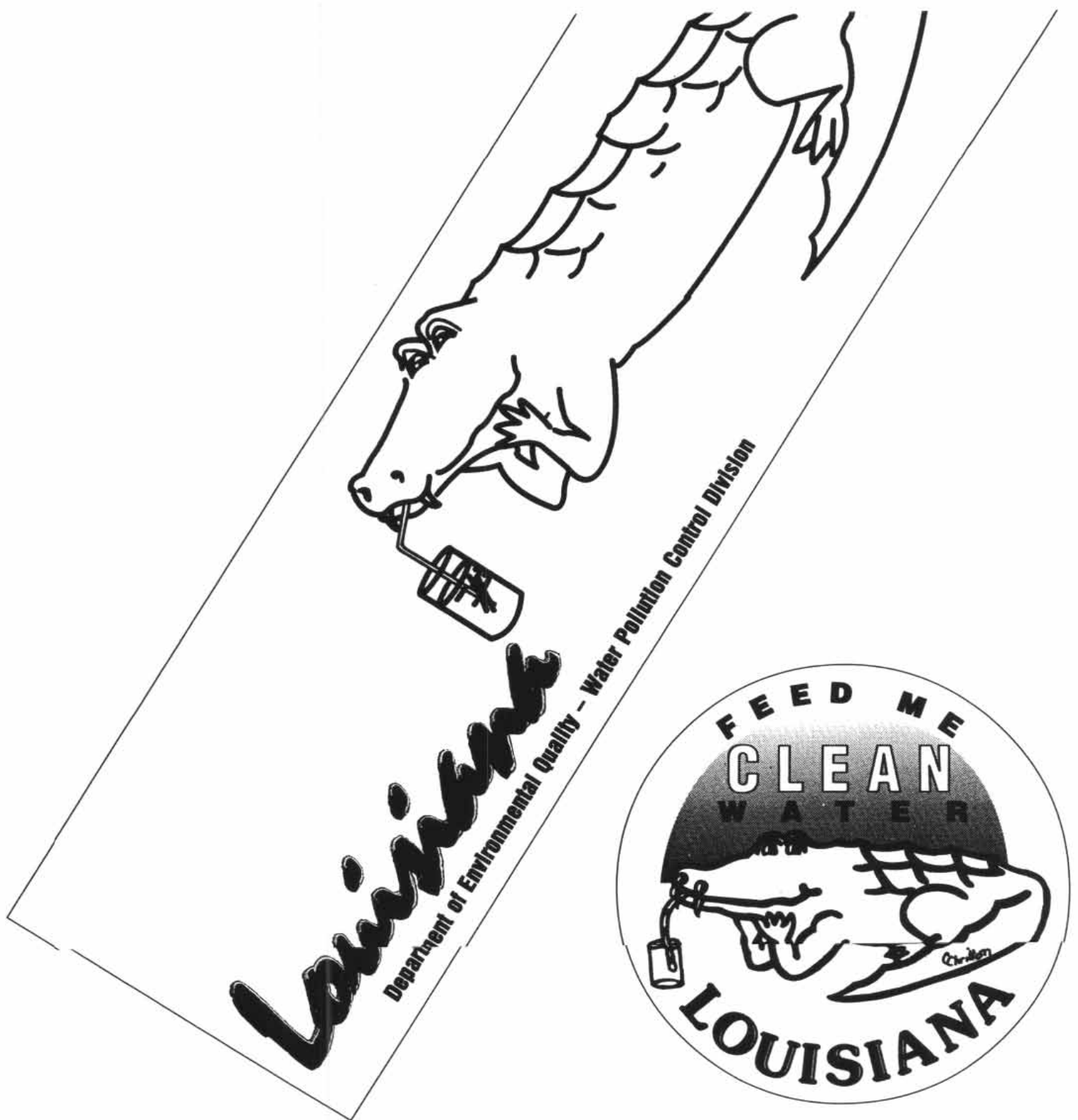


Figure 19. A water conservation ethic for upstream states—humorously articulated by the state of Louisiana—has positive global benefits.



Figure 20. Riparian wetlands and the flora and fauna that survive there depend upon consistent river flows. Photo by Jerry D. Vineyard.

INDIAN WATER RIGHTS AND OUT-OF-BASIN DIVERSIONS

A highly uncertain aspect of river basin water politics is the matter of tribal water rights and the announced intention of some Indian tribes to sell water for profit to interests outside of the Missouri River basin. When water is taken from a stream in one basin and moved over a divide into another basin, it is a total loss—or depletion—to the basin from which it was diverted.

One of the most spectacular examples of such a diversion is the Central Arizona Project, which takes water from the Colorado River through a canal to water-short southern California, thereby greatly depleting the flow of the lower Colorado.

Missouri consistently and aggressively opposes out-of-basin diversions from the Missouri River basin. Large-scale out-of-basin transfers from the Missouri River upstream from Missouri would ultimately reduce the flow of the river through the state of Missouri, to the point where its many benefits would be severely reduced. Moreover, taking water permanently from a stream has negative effects on the entire ecosystem. In the case of the Missouri River, these negative consequences extend all the way to the Gulf of Mexico (figure 20).

The reality of Indian Water Rights (IWR)—simply expressed—is that Indian tribes have a right to a share of water from both streams and groundwater sources, by treaty with the U.S. Government. Through a long history of adjudication, courts have upheld those rights, and there have evolved methods based on arable land for determining how much water is involved. Indian tribes have a legal status similar

to that of states.

Indian water rights are at issue primarily in the Missouri River Basin, which has 27 to 28 separate tribes living on reservations (figure 21). All of these reservations lie in states upstream from Missouri, but their water rights impact the river flow through our state. The Mini-Sose Intertribal Coalition, representing perhaps half of the basin tribes, has made a preliminary claim to a total of 21,489,000 acre-feet of Missouri River water, of which 10,926,000 acre-feet is estimated to be net depletions.

The proposed use of the water is for irrigation, domestic needs, and for whatever purposes the tribes may wish to use the water for. Water marketing—including the for-profit transfer of water across basin boundaries—is a right that has been aggressively sought by some Indian tribes.

Only a few tribes have pursued their claims in the courts, to the point where agreement has been reached on the total amount of water that belongs to them. Indian claims are adjudicated based upon what is known as the Winters Doctrine, which is a complex, court-approved procedure for determining how much water a tribe is entitled to. Customarily, water rights are determined on the basis of a complex formula that uses “potentially irrigable acreage” as a determinant of the right.

Generally speaking, the concept of determining water rights based on potentially irrigable acreage results in settlements that grant Indians far more water per capita than the average Missourian can expect. For exam-

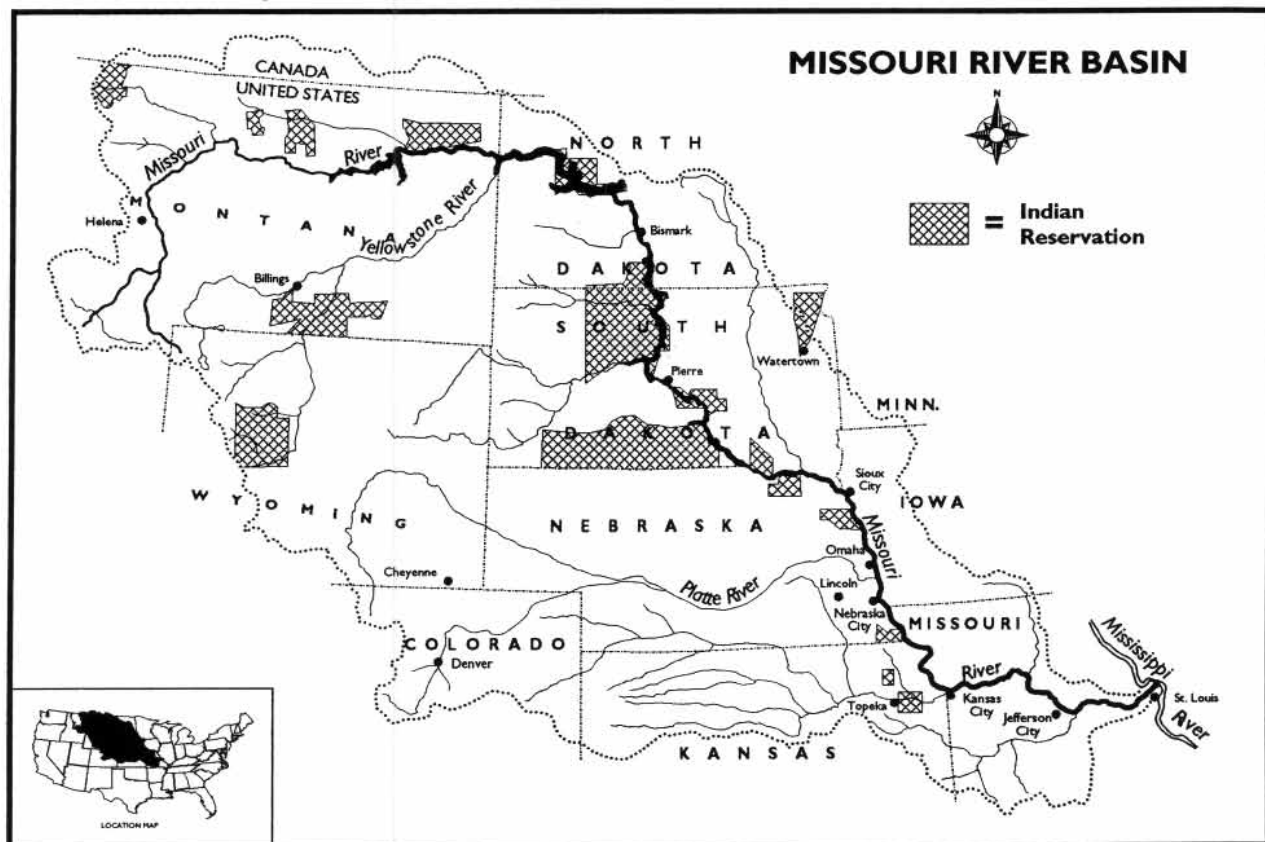


Figure 21. Indian reservations in the Missouri River Basin.

ple, two tribes in Western Montana with an aggregate population of about 5,000 were granted the right (by compact with the State of Montana) to use 1,050,000 acre-feet of water per year from the Missouri River. This translates to 210 acre-feet of water per person per year (one acre-foot equates to 326,700 gallons). Looking at it from a purely statistical viewpoint, each tribal member has a right to use 68.6 million gallons of water per year.

In stark contrast, the typical ratepayer in the St. Louis County water system, which draws raw water from the Missouri River and purifies it for domestic use, uses an average of 150 gallons per day, which is a total of 54,750 gallons per year. Comparing the tribal member's RIGHT with the St. Louis resident's ACTUAL USE, it is apparent that the Indian can use—or sell to the highest bidder—more than 1,250 TIMES the amount currently purchased by a typical Missourian.

There is an important distinction between a Missourian's actual USE of water and an Indian's RIGHT to water. Theoretically, a Missourian can use as much water as he is

willing to pay for, but the tribal member considers his right as ownership of a commodity that he may—if he chooses—sell for profit. If the right includes the authorization to sell water out of basin, then the Indian has the potential to deprive the Missourian of access to as much water as he needs.

Pursuing this thinking to its obvious conclusion, there could come a time when Missourians would have to purchase water from Indian tribes in order to keep them from selling the Missouri River out of basin to the highest bidder(s). Indeed, this option was actually offered—as the right of first refusal to downstream states—in discussions with tribes' legal counsel related to Congressional ratification of the compact between Montana and two tribes in that state. While Congressional ratification was not forthcoming, the water rights compact between the tribes and the state of Montana, granting the two tribes 1,050,000 acre-feet of water—is still in force.

The Indian reservations in the Missouri River Basin have potentially irrigable acreage, and therefore, tribal members have rights to

use water from the river or from the associated groundwater. By far the largest number of tribal claims have never been adjudicated, so it is unclear how much water may ultimately be allocated to tribal uses. However, estimates have been made by both the Corps and tribal officials. On the low side, Corps estimates of 3.5 million acre-feet (MAF) were used in the Corps' Missouri River Master Manual Draft Environmental Impact Statement (DEIS). A much higher estimate—6.5 MAF—was also considered by the Corps. However, the highest estimate seen thus far was prepared by the Mni-Sose Intertribal Water Rights Coalition, Inc.: 21.5 MAF in total rights, of which 10.9 MAF could be depleted.

Putting this in context, recall that the total average annual outflow from the Missouri River reservoir system is 20 MAF. If the tribes, who all live on reservations, most of which are upstream from Gavins Point Dam (which controls the outflow from the six main-stem reservoirs on the Missouri River) should ultimately

deplete 10.9 MAF, then the Missouri River flow from Gavins Point into the state of Missouri would be only 9.1 MAF. Recall also that this is **ONLY** tribal water—no depletions from new diversions by states are included.

More troubling than the **AMOUNT** of Indian Water Right claims is the tribes' demand that they be allowed to market water out of basin, for profit. Any water diverted out of basin is a net loss—or depletion—to downstream states. Tribal water agreements are sometimes determined through compacts with states. However, interstate out-of-basin diversion rights must be granted by Congress. Bills to grant this right to two tribes in western Montana have been introduced in Congress, but have been successfully thwarted by the Missouri Congressional delegation. Constant vigilance will be required, however, to insure that such diversion rights are not granted through a legislative ploy such as attaching language to a bill written for a different purpose.

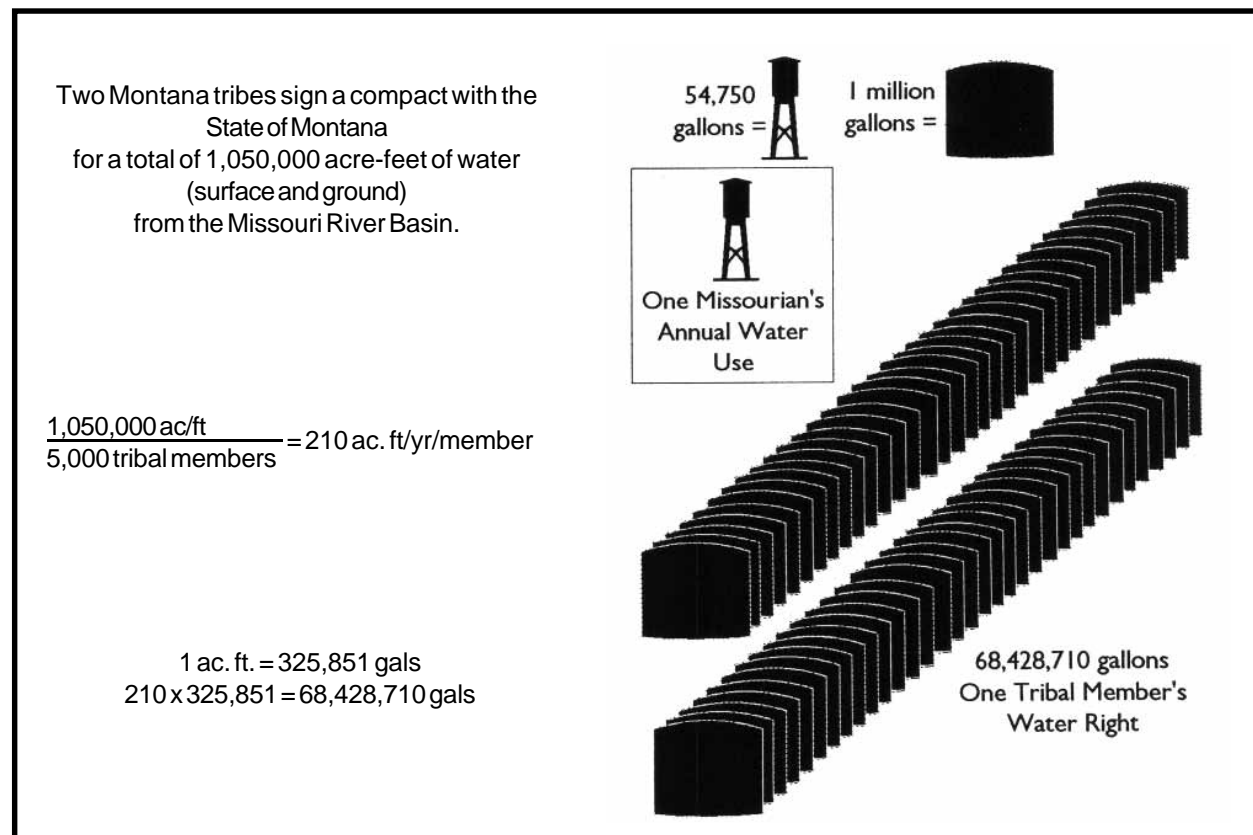


Figure 22. Comparison of tribal member vs. Missouri ratepayer's relationship to Missouri River water.

RESERVATION	ANNUAL DIVERSION (Acre-feet)	ANNUAL DEPLETION (Acre-feet)
Blackfeet	878,000	323,000
Fort Belknap	211,000	87,000
Crow	2,114,000	738,000
Sioux Tribes	16,686,000	8,638,000
Wind River	510,000	480,000
Northern Cheyenne	90,000	30,000
Fort Peck	1,000,000	630,000
TOTAL	21,489,000	10,926,000

Table 2. Mni-Sose Intertribal Water Rights Coalition, Inc.; preliminary quantification of Missouri River basin water rights by tribe.

Case study of quantification of Indian Water Rights in accordance with the Winters doctrine.

“The Fort Peck-Montana Compact was a negotiated settlement of the Fort Peck water rights case in the context of adversarial and hotly contested litigation that went to the Supreme Court on jurisdictional questions. (See *Arizona v. San Carlos Apache Tribe*, 463 U.S. 545 (1983)). The standard from *Arizona v. California* was used by the parties to establish the quantity of the Fort Peck tribal water right, as it was used in the Wyoming case and other cases now pending. The Tribes’ expert hydrologist was Stetson Engineers, the expert witnesses upon whose testimony the quantification in the Wind River Wyoming case was based. Both Stetson Engineers and State experts agreed to study practical irrigable acreage on the Reservation, did a land classification, and exchanged the standards being used for analysis and interpretation.

Stetson Engineers carefully studied all existing data for all lands on the Reservation. After several months of study, Stetson Engineers determined that 501,755 acres—nearly one-quarter of the Reservation—could feasibly be irrigated out of the Missouri River, which forms the southern boundary of the Reservation. In making that determination, Stetson Engineers analyzed the Soil Conservation Service data for all lands on the Reservation. They identified all irrigable lands, and planimetered them to determine acreage. Irrigable lands were classified in classes II, III and IV. There were no Class I lands and only 19,870 acres were Class IV. Climate was also carefully analyzed. The lands determined to be irrigable by Stetson Engineers were shown on a series of 27 maps prepared by them.

The State’s experts reviewed Mr. Stetson’s analysis, and completed their own review of Reservation lands. The State used the ‘prime and important’ land classification of the Soil Conservation Service and agreed that 487,763 acres on the Reservation were irrigable from the Missouri River. The State decided that their studies verified the practicably irrigable acreage determined by Stetson Engineers, and ultimately accepted the Stetson acreage determination; there was in fact only a 3 percent difference. Both Stetson Engineers and the State experts considered that a 300-foot elevation above the Missouri River would be an economically feasible service area. Therefore, all the lands that were analyzed were those below this 2,300 foot contour.”

Source: Quoted from a memo from Reid Peyton Chambers, General Counsel for the Assiniboine and Sioux Tribes, Fort Peck Reservation, Montana, to Simon B. Buckner, Assistant Attorney General, Missouri, dated August 3, 1992.

INTERSTATE RIVER BASIN ORGANIZATIONS: THE MECHANISMS FOR INTERSTATE COORDINATION AND COOPERATION

ASSOCIATION: noun; 1 the act of associating; 2 the state of being associated; companionship; fellowship, partnership; 3 an organization of persons having common interests, purposes, etc.

1. MISSOURI RIVER BASIN ASSOCIATION

MRBA

Missouri River Basin Association

MRBA at a glance:

Members:

Missouri
Montana
Iowa
Nebraska
Kansas
Wyoming
North Dakota
*South Dakota
Mini-Sose Intertribal Coalition

Federal Associates:

Corps of Engineers
Bureau of Reclamation
Bureau of Indian Affairs
Fish & Wildlife Service
Environmental Protection Agency
Geological Survey
Western Area Power Administration
Maritime Administration
National Park Service

Executive Director:

Richard H. Oppen

Meetings:

At least quarterly, at various locations throughout the basin, or chosen for convenience

Dues:

\$8,000 per year per Member (federal Associates pay no dues)

Address:

Missouri River Basin Association
P.O. Box 9193
Missoula, MT 59807
Phone (406) 542-6272
FAX (406) 542-7585

Newsletter:

"The Missouri River Report"

Frequency:

Quarterly

**South Dakota withdrew from the MRBA in summer 1995.*

The states of the Missouri River Basin organized the Missouri River Basin Association (MRBA) in the early 1980s in the aftermath of the Reagan administration's disbanding of the U.S. Water Resource Council. The council had operated a number of interstate river basin commissions, of which the Missouri River Basin Commission was one. In disbanding the Council and its various basin commissions, the administration invited states to form their own organizations to continue the coordination and cooperation that had been fostered by the commissions.

The Basin commissions typically had a presidentially-appointed Commissioner, and a budget sufficient to employ staff to carry out the responsibilities assigned to them. The Missouri River Basin Commission was typical of most commissions in having an active staff and a bank account of unspent federal funds.

In disbanding the commissions, the administration offered the unspent funds to the states if they formed acceptable organizations to carry on the work.

In this manner, the Missouri River Basin Association (MRBA) began with a treasury of about a half million dollars. The Commission staff was not retained, and the office files and other assets were either retained or distributed among the members.

Missouri has maintained continuous membership in the MRBA, paying dues consistently and regularly attending meetings. The Governor appoints Missouri's member of the board of directors, which has been the Director of the Department of Natural Resources. And, two Alternates are currently named by the Governor: DNR Director of Intergovernmental Cooperation, and the Division of Geology and Land Survey's State Water Resources Coordi-

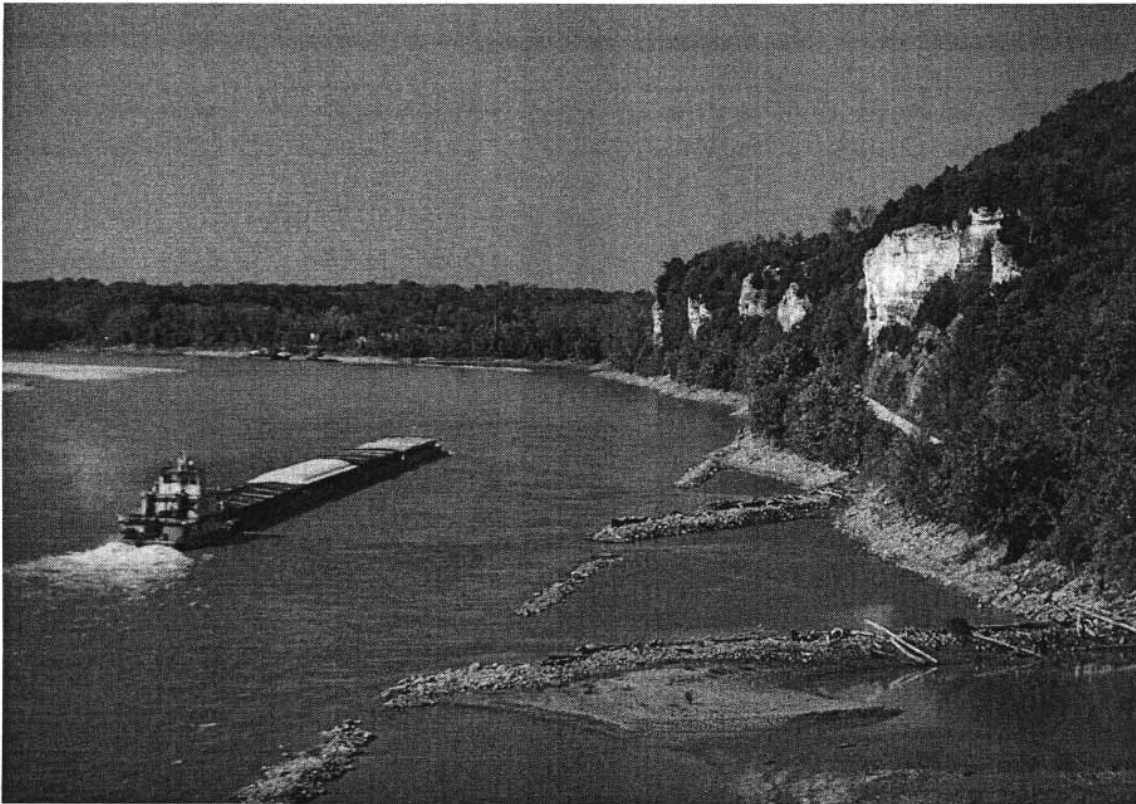


Figure 23. Navigation on the Missouri River depends upon reliable flows being released from the main-stem reservoir system, to maintain navigation depths during the customary eight-month season. Pictured: tow heading upriver past bluffs near Rocheport, Missouri. Katy Trail State Park is visible as a path along the base of the bluffs on the right. Photo by Jerry D. Vineyard.

nator. The Water Resource Program of DNR's Division of Geology and Land Survey provides budget and technical support.

There are 10 states in the Missouri River Basin, but only seven are currently members

of the MRBA. The states of Colorado and Minnesota, having only small areas within the basin, chose not to participate in the association. The state of South Dakota had been an active member until mid-1995, when Gover-

The Corps of Engineers operates the Missouri River system according to requirements in a document called the Missouri River Master Water Control Manual (Master Manual) that embodies the intent of Congress when it passed the Flood Control Act of 1944. The Master Manual directs the Corps to hold water in the large upper basin reservoirs during high flow, to prevent flooding downstream, and to release that water during drought events in order to meet needs on the lower river for water supply, power plant cooling water, navigation, and other purposes. The Master Manual requires the Corps to operate under strict engineering principles that insure that the system can not only protect from massive flooding but also withstand the ravages of severe drought such as the drought of the 30s, that lasted 12 years (figure 24).

Annual Runoff at Sioux City, Iowa

Adjusted to 1949 Level of Depletions

Source: Mo. River Annual Operating Plan, 1995-96, p. 30.

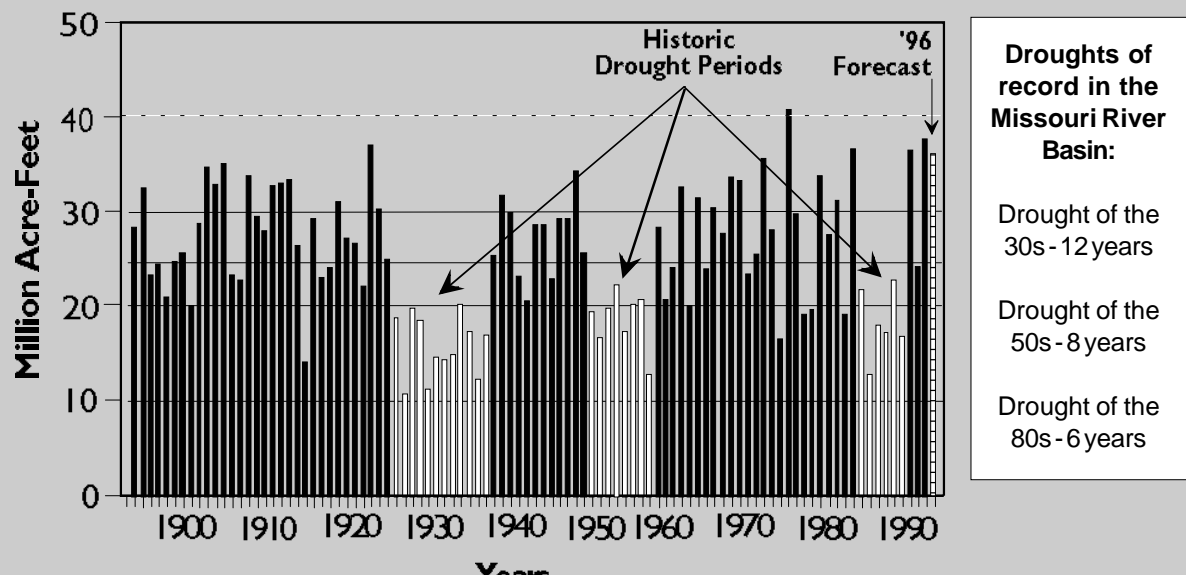


Figure 24. Droughts of record in the Missouri River Basin.

The reservoir system had not been tested under drought conditions until a severe drought began in 1988. When the Corps began to draw the reservoir levels down in accordance with the Master Manual, the upstream states objected, citing economic losses to lake-based recreation in the Dakotas and Montana. Upstream state governors demanded that the Corps abandon the management strategy embodied in the Master Manual in favor of a different strategy that would maintain high lake levels by reducing the volume of water released to meet downstream needs.

The Corps responded by 1) beginning a restudy of the Master Manual, and 2) by imposing selected departures from Master Manual requirements, principally by reducing the length of the navigation season and by arbitrarily reducing flow support for navigation. These actions ignited a continuing upstream vs. downstream controversy that flared throughout the six-year drought and today seems far from a satisfactory resolution.

nor William Janklow withdrew from the Association because he did not agree with the Association's handling of the Master Manual controversy, an issue which has polarized the MRBA since about 1988.

Membership in the MRBA had not been open to the Indian tribes in the basin until recent years, when the state members voted to offer member status and one seat on the board to represent the tribes living on reservations within the basin. There are some 28 tribes, but not all of them are represented. The Mni-Sose Intertribal Water Rights Coalition currently represents 27 tribes, paying the same annual dues as a member state.

The MRBA has no statutory authority, but it does exert considerable influence when it takes unified positions on Congressional legislation, and it works closely with the Corps of Engineers and other federal agencies involved in issues affecting the river. For example, the Corps consults with MRBA during the development of the Annual Operating Plan (AOP) for the River.

The AOP states specifically how the Corps will operate the Mis-

souri River during a given year. The Master Manual sets forth overall requirements, and the AOP documents how the Corps will carry out those imperatives. The customary procedure is for the Corps to prepare a draft AOP, then convene public meetings to ask for input from the various river users before publishing a final report that will guide the Reservoir Control Center in Omaha during the forthcoming year (figure 25).

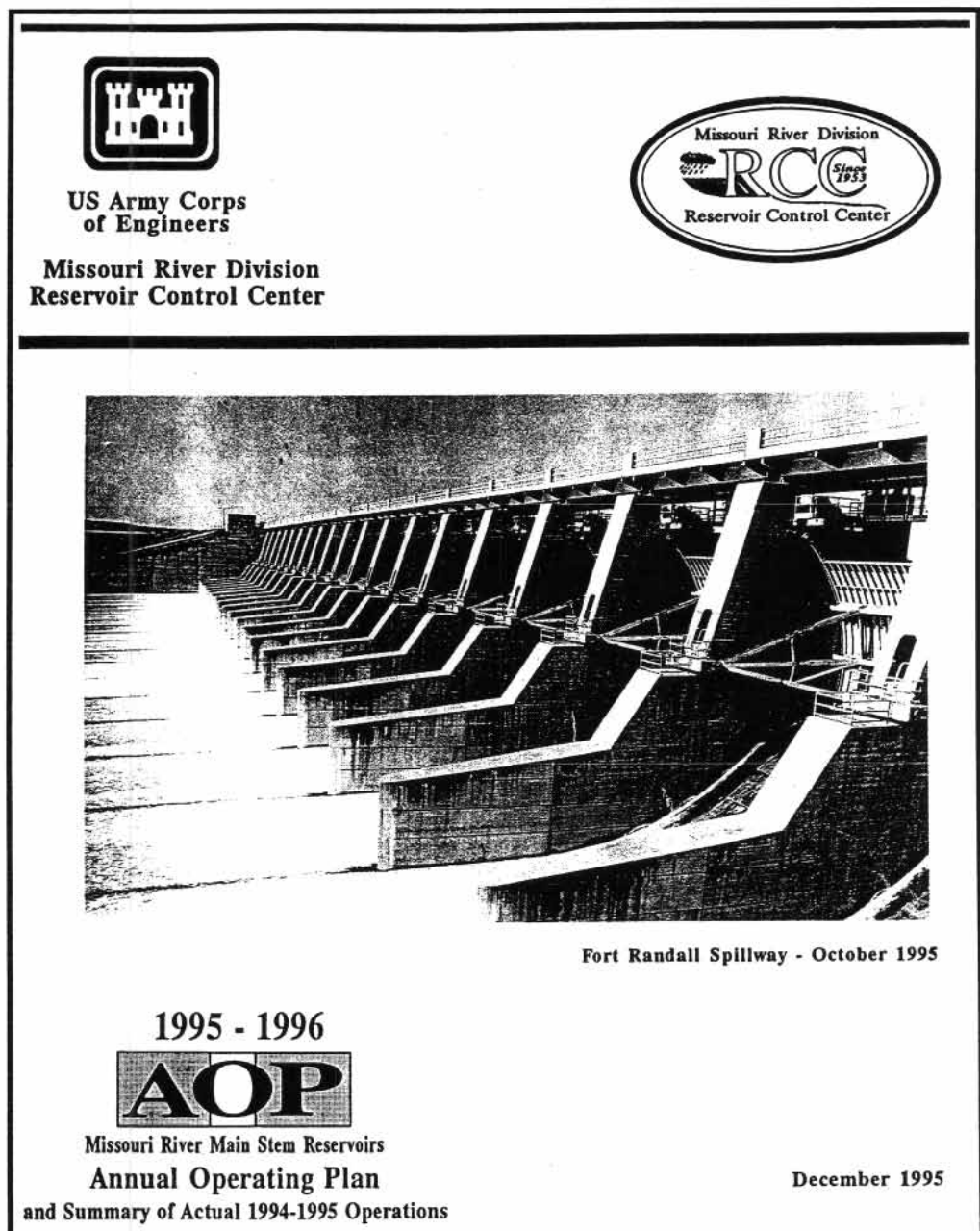


Figure 25. The Annual Operating Plan guides Corps management of the system during the year.



Figure 26. Missouri vigorously opposed the Corps' Preferred Alternative for managing the Missouri River, partly on the grounds that the proposed "Spring Rise" would have increased the risk of flooding, such as experienced in the Great Flood of '93. Pictured is the Missouri River at Jefferson City. Photo by Jerry D. Vineyard

The most critical issue of recent years has been the update and revision of the Missouri River Master Water Control Manual (Master Manual), the document prepared and used by the Corps to manage the river in accord with the Water Development Act of 1944, known as the Pick-Sloan Plan. Severe and persistent drought in the basin during the late 1980s and early 1990s prompted upper basin interests to call for changes in the Master Manual's requirements for system operations.

Revision of the Master Manual has been a slow and frustrating process, costing the

Corps some \$12.5 million and requiring eight years to date to conduct studies, public involvement, and review of a Draft Environmental Impact Statement (DEIS). The Corps developed a Preferred Alternative that would have drastically changed the management plan for the Missouri River. However, testimony during a series of 24 public hearings ran strongly against the Corps' plan, causing them to suspend further work on the Preferred Alternative pending completion of several additional studies to cover shortcomings identified in the hearing process.

2. ARKANSAS-WHITE-RED BASINS INTER-AGENCY COMMITTEE (AWRBIAC)

COMMITTEE: noun. 1 a group of people chosen, as from the members of a legislature or club, to consider, investigate, and report or act on some matter or on matters of a certain kind; 2 a group of people organized to support some cause.



ARKANSAS-WHITE-RED BASINS INTER-AGENCY COMMITTEE

AWRBIAC at a glance:

State Members:

Louisiana
Missouri
Arkansas
Texas
Kansas
Colorado
Oklahoma
New Mexico

Federal Members:

Agriculture
Army
Commerce
Energy
Housing and Urban Development
Interior
Transportation
Environmental Protection Agency
Federal Emergency Management Agency

Administration:

No staff; no permanent office.
Administrative tasks are rotated among the members.

Meetings:

Twice a year, in Spring and Fall
Meetings are numbered; Spring 1996 was the 137th meeting of AWRBIAC. Meetings are hosted by volunteers at various locations usually within the basins.

Dues:

None; expenses of the organization are minimal. A registration fee is charged at each meeting that is sufficient to cover costs incurred, such as room rental, etc.

Address:

AWRBIAC has no permanent office; the address changes annually, residing with the current chair, which may be either a state or a federal agency. For 1995-96, the address is:

Arkansas-White-Red Basins Inter-Agency Committee
c/o Tom Wehri
Rm. 5404, Federal Building
Little Rock, AR 72201

Publications:

No newsletter; AWRBIAC publishes an annual report, and a "Directory of State and Federal Officials Engaged in Water Resource Development."

Among the interstate river basin associations to which Missouri belongs, AWRBIAC is the least costly, though not necessarily the least effective. Coordination and cooperation are the primary focus of its activities; it employs no staff and its treasury rarely contains more than \$500.

AWRBIAC held its first meeting in September 1955, in Tulsa, Oklahoma. Its purpose is to **“...provide facilities and procedures for the coordination of the policies, programs, and activities of the federal agencies and states in the field of water and related land resources investigation, planning, construction, operation and maintenance; provide means by which conflicts may be resolved; and to provide procedures for coordination of their interests with those of other federal, local governmental, and private agencies in the water and related land resources field.”**

The business of the Committee is conducted at meetings, which are normally held twice a year, in the spring and fall. Agendas for the meetings usually include time for coordination, deliberations and reports, technical sessions, and field trips. Meetings may be held more frequently than semi-annually, if necessary or desirable.

Currently, AWRBIAC has subcommittees organized by basin, that deal specifically with issues germane to the individual basins. For example, the White River subcommittee is concerned with dissolved oxygen, while the Arkansas River subcommittee focuses on the Montgomery Point Lock and Dam, and the Red River subcommittee deals with saltwater contamination.

Administration of AWRBIAC is a low-budget, low-frills, all business operation. Expenses are usually borne by whichever agency or state is chairing the Committee, as part of the normal cost of doing business. The mailing list is small; secretarial services are usually provided by the chair's agency.

For Missouri, the Governor appoints a Representative and one or more Alternates. Currently, the Director of the Department of Natural Resources represents Missouri, and there are two Alternates: DNR Deputy Director for Intergovernmental Cooperation, and the River Basin Coordinator in the Division of Geology and Land Survey. The DNR Division of Geology and Land Survey's Water Resources Program provides technical and budgetary support.

3. LOWER MISSISSIPPI RIVER CONSERVATION COMMITTEE (LMRCC)

The LMRCC was organized in 1994 to provide a forum for dealing with lower Mississippi River natural resource issues. It is modeled after similar organizations on the Missouri River (Missouri River Natural Resources Committee) and the upper Mississippi (Upper Mississippi River Conservation Committee). However, it differs from these organizations in having membership almost equally divided between traditional fish and game agencies, and environmental resource and regulatory agencies such as departments of natural resources.

Missouri has two member agencies: the Department of Conservation, and the Department of Natural Resources. Both agencies pay

the \$1,000 per year annual dues. In the Department of Natural Resources, the annual dues are split 50-50 between the Division of Geology and Land Survey and the Division of Environmental Quality.

The LMRCC has not existed long enough to establish a significant track record, but its mission is to **“...promote the protection, restoration, enhancement, understanding, awareness, and wise use of the natural and environmental resources of the Lower Mississippi River, through coordinated and cooperative efforts involving research, planning, management, information sharing, public education and advocacy.”**



LMRCC at a glance:

Members:

Arkansas Dept. of Pollution Control and Ecology
Arkansas Fish & Game Commission
Kentucky Dept. of Fish and Wildlife Resources
Louisiana Dept. of Environmental Quality
Louisiana Dept. of Wildlife and Fisheries
*Mississippi Dept. of Environmental Quality
*Mississippi Dept. of Wildlife, Fisheries and Parks
Missouri Dept. of Conservation
Missouri Dept. of Natural Resources
Tennessee Dept. of Environment and Conservation
Tennessee Wildlife Resources Agency

Cooperating agencies and organizations:

Texas Parks and Wildlife Agency
Gulf States Marine Fisheries Commission
U.S. Army Corps of Engineers
U.S. Fish & Wildlife Service
U.S. Environmental Protection Agency
U.S. Geological Survey

Coordinator:

Ron Nassar (601)638-1891

Meetings:

LMRCC holds an annual meeting, usually in late winter, at various sites within the basin. Standing committees may hold specific meetings as required.

Dues:

\$1,000 per year per member agency.

Address:

Lower Mississippi River Conservation Committee
Room 236, Thomas Building
900 Clay Street
Vicksburg, MI 39180

Newsletter:

"The LMRCC Newsletter"

Frequency:

Quarterly

*Mississippi agencies withdrew from the LMRCC in 1996.

To carry out its mission, LMRCC has six technical sections charged with dealing with the following issues: (1) Fisheries; (2) Wildlife; (3) Law Enforcement; (4) Recreation; (5) Water Quality; and (6) Red River.

LMRCC has a Chairperson, Chairperson-Elect, and Secretary-Treasurer, select-

ed from the members. The organization employs no staff, but a Coordinator manages the affairs between meetings, and edits the newsletter. The Coordinator is an employee of the U.S. Fish & Wildlife Service, with an office in Vicksburg, Mississippi.

4. UPPER MISSISSIPPI RIVER BASIN ASSOCIATION (UMRBA)

UMRBA at a glance:

State Members:

Iowa
Missouri
Wisconsin
Illinois
Minnesota



Upper
Mississippi River
Basin Association

ILLINOIS, IOWA, MINNESOTA, MISSOURI, WISCONSIN

Federal Advisory Members

Department of Agriculture
Department of the Army
Environmental Protection Agency
U.S. Department of the Interior
U.S. Department of Transportation

Address:

Upper Mississippi River Basin Association
415 Hamm Building
408 St. Peter Street
St. Paul, MN 55102
(612)224-2880

Executive Director:

Holly Stoerker

**Newsletter:*

"The River Register"

Frequency:

bimonthly

Meetings:

Quarterly; meetings are numbered, i.e., the 57th quarterly meeting was held in St. Louis, Missouri Feb. 20-22, 1996.

Serial Publications:

"Mississippi Clippings," a monthly compendium of clippings from major news sources within the basin; "Legislative Summary," an occasional compilation of basin-related Congressional legislation, issued from time to time when Congress is in session. Issued in loose-leaf format, it is designed to be updated frequently during the course of Congressional sessions.

Dues:

State Members pay \$35,000 per year;
Advisory Members pay no dues.

*The River Register was terminated in 1997 as a cost-cutting measure.

The five states of the Upper Mississippi River Basin organized the Upper Mississippi River Basin Association (UMRBA) after the Reagan administration dismantled the Water Resource Council and its river basin commissions. Unexpended funds in the accounts of the Upper Mississippi River Basin Commission were given to the UMRBA upon its organization.

The UMRBA maintains a permanent staff of three, in offices in St. Paul, Minnesota. Additional temporary staff are employed as needed to carry out requirements of externally-funded programs and other activities related to, but not part of normal administrative duties.

Each state has one representative to the Board of Directors of UMRBA, appointed by the respective governors. For Missouri, the Representative is usually—but not necessarily—the Director of the Dept. of Natural Resources. In addition, governors may appoint Alternates; Missouri has two, the DNR Deputy Director of Intergovernmental Cooperation, and the River Basin Coordinator.

The DNR/DGLS Water Resources Program provides technical support. The representatives select a chairperson from among themselves. In practice, the chair rotates among the five state members.

JOINT GOVERNORS' PROCLAMATION ON UPPER MISSISSIPPI RIVER SYSTEM MANAGEMENT

April 1997

PURPOSE

The purpose of this proclamation is to protect and enhance the future of the Upper Mississippi River System as a multi-purpose resource by setting forth principles governing its management and affirming means and mechanisms for intergovernmental cooperation.

FINDINGS

The governors of the signatory Upper Mississippi River Basin States jointly find and declare that:

The Upper Mississippi River is a valuable national and regional resource. Its ecological, economic, and cultural significance extends beyond its waters and shoreline communities. The region's prosperity and quality of life are dependent upon the river's continuing viability as a commercial transportation system, an ecologically rich fish and wildlife habitat, a source of water supply, and a recreational resource.

The States, in partnership with the federal government, share a continuing responsibility for the wise use and management of the Upper Mississippi River System. While the federal government's role is an important and long-standing one, the States of the basin possess a unique obligation to manage the waters of the basin in the interest of all the citizens of the region.

The States have historically exercised leadership in promoting the collective stewardship of the resources of the Upper Mississippi River Basin. The rich heritage of interstate and intergovernmental collaboration, evidenced by the creation and maintenance of cooperative forums such as the Upper Mississippi River Basin Commission and the Upper Mississippi River Basin Association, is the States' responsibility to nurture.

The relationship between maintaining a healthy economy and a healthy environment is becoming increasingly clear. Effective management of the Upper Mississippi River System will require enhanced collaboration among all units of government and the pursuit of unified economic and environmental policies.

INTERGOVERNMENTAL COORDINATION

The Governors hereby jointly declare that:

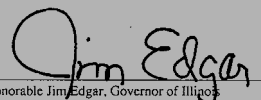
- ** The states reaffirm their individual and collective support for the Upper Mississippi River Basin Association, established in 1981 by representatives of the five basin states.
- ** The purpose of the Upper Mississippi River Basin Association shall be to foster achievement of the above stated principles by facilitating dialogue and cooperative action among its member states and between those states and the federal government.
- ** The responsibilities of the Upper Mississippi River Basin Association shall include, but not be limited to, the study and evaluation of issues of common concern to the member states; creation of opportunities and means for information exchange on policy and scientific matters; review and comment on federal projects, programs, and policies of regional significance; and development and administration of intergovernmental agreements.
- ** The Upper Mississippi River Basin Association shall provide a forum whereby the Governors seek to unify the states' river-related policies and articulate their mutual concerns and shared vision for management of the Upper Mississippi River.
- ** In fulfilling its purpose and responsibilities, the Upper Mississippi River Basin Association shall be responsive to public concerns, seeking to include all river constituencies in consensus-building.
- ** Each of the member states of the Upper Mississippi River Basin Association shall be represented by designees of the Governor. Those individuals shall be responsible for insuring that all appropriate agencies, boards, commissions, and constituencies of the state are engaged in the deliberations and activities of the Upper Mississippi River Basin Association.
- ** The President of the United States is hereby requested to ensure that all federal departments and agencies with authorities related

to the Upper Mississippi River cooperate with the Upper Mississippi River Basin Association and utilize that forum for coordination of their river-related policies and programs with the basin states.

PRINCIPLES FOR MANAGEMENT


The Governors agree and commit to the following principles for management of the Upper Mississippi River System:

- ** The Upper Mississippi River System shall be managed to ensure the needs of present generations are met without compromising the ability of future generations to meet their needs.
- ** Comprehensive management for multiple purpose use shall be the foundation of Upper Mississippi River policies and programs. This approach recognizes the multiple objectives which the public expects the river system to serve and integrates environmental and economic decision-making to achieve these objectives.
- ** The relationship between the river system and its watersheds shall be recognized in management decisions.
- ** There shall be an appropriate balance of power and responsibility between the federal government and the basin states such that states and federal agencies are permitted and encouraged to work cooperatively to achieve mutual river management objectives.
 - * The states shall take responsibility for more fully integrating comprehensive management objectives for the Upper Mississippi River System into their own programs and policies. State agencies shall work cooperatively with one another on an intra- and interstate basis.
 - * The federal government shall be expected to unify its policies to reflect comprehensive management and to provide consistency among federal agencies. In addition, the federal government must recognize states as partners in river management.
- ** Mechanisms to facilitate development and implementation of a common vision and shared goals and objectives for the Upper Mississippi River System shall be established and maintained. Consensus building involving all river constituencies shall be pursued and the anticipated effects of management decisions communicated widely.
- ** Policy and management decisions shall be based upon scientifically sound environmental and economic analysis.
- ** Management objectives shall emphasize results and planning shall lead to action. Those actions shall be routinely evaluated and flexibility preserved to adapt to changing needs and conditions.
- ** The Upper Mississippi River Basin Association shall be governed by the Articles of Association executed in 1981 and hereby authorized to be amended as necessary to reflect the principles and declarations of this joint proclamation.
- ** Nothing in this proclamation nor in the conduct of the affairs of the Upper Mississippi River Basin Association shall abrogate the rights and responsibilities of each state to manage its water and related land resources. The Upper Mississippi River Basin Association shall undertake no activities which would be inconsistent with the Compact Clause or the Interstate Commerce Clause of the U.S. Constitution.


Honorable Jim Edgar, Governor of Illinois


Honorable Terry E. Branstad, Governor of Iowa


Honorable Arne H. Carlson, Governor of Minnesota


Honorable Mel Carnahan, Governor of Missouri


Honorable Tommy G. Thompson, Governor of Wisconsin

UMRBA differs from the other basin organizations to which Missouri belongs primarily in the level of its activities. With a permanent staff of three, and a budget about twice that of the other three basin groups combined, UMRBA has become quite successful and very adroit in developing productive interaction with Congress, federal agencies and interest groups.

In 1994, UMRBA began an introspective process to "reinvent itself," considering whether a better alternative existed that might result in a more effective collaboration in addressing issues. Following a special conference during which alternative organizational models were presented, the Board decided to continue UMRBA essentially unchanged, except for making the relationships with federal agencies somewhat more formal. A revised cooperative agreement was signed as a governor's Proclamation in 1997.

Perhaps UMRBA's greatest achievement, which began while the original Upper Mississip-

pi River Basin Commission was operating, was the development of a Master Plan for the river. When the Plan was completed, it was presented to Congress and ultimately resulted in funding of the Environmental Management Program (EMP). The significance of a group of states and several federal agencies working together to develop a plan for what needs to be done was not lost on Congress.

Today, the EMP is the vehicle through which federal funding comes to the basin for long-term environmental monitoring, rehabilitation and enhancement of fish and wildlife habitat and the general ecology, and the technical data and studies necessary for intelligent planning.

The Environmental Management Program is a direct result of emerging problems relating to navigation on the river. Congress authorized construction of a second lock at Locks and Dam 26 at Alton, Illinois, to relieve congestion on this busy stretch of the river. At the same time, Congress recognized the need to balance in-

ENVIRONMENTAL MANAGEMENT PROGRAM

EMP at a glance:

Established by Congress in 1986, as a "...long-term program designed to protect and balance the resources of the Upper Mississippi and guide future river management," with the following five elements:

- Habitat Rehabilitation and Enhancement Projects
- Long Term Resource Monitoring
- Recreation Projects
- Economic Impacts of Recreation Study
- Navigation Monitoring

Environmental Management Technical Center, Onalaska, Wisconsin

Funding is through the Corps of Engineers, with funds for the LTRMP funneled through the Corps to the National Biological Service.

Joint effort of the Corps of Engineers, U.S. Fish & Wildlife Service, and the states.

Environmental Management Program Coordinating Committee:

Agency Representatives:

- U.S. Army Corps of Engineers (Co-chair)
- U.S. Fish & Wildlife Service (Co-chair)
- Illinois
- Iowa
- Minnesota
- Missouri
- Wisconsin
- U.S. Dept. of Agriculture
- U.S. Environmental Protection Agency
- U.S. Geological Survey
- U.S. Dept. of Transportation

Administration:

The Mississippi Valley Division of the Corps of Engineers manages the program and is guided in its policies by the Office of the Chief of Engineers.

Address:

111 North Canal Street
Chicago, IL 60606-7205
(312)353-6345

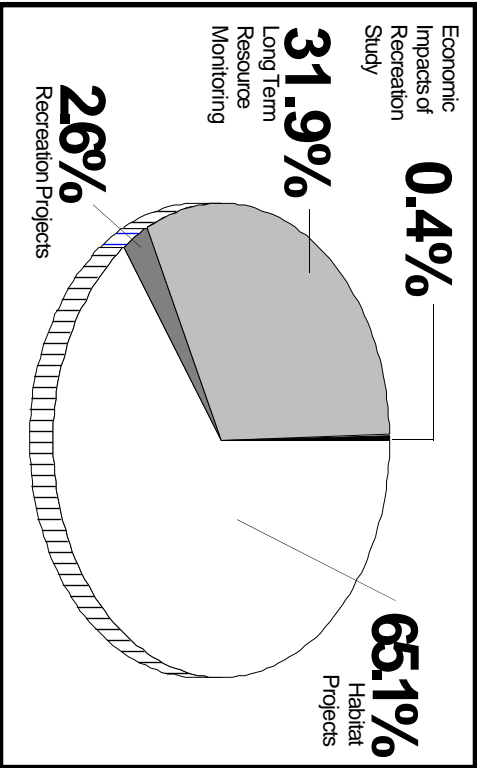


Figure 27. Funding percentages for the Environmental Management Project (EMP). About 97% of funding is targeted for habitat projects and resource monitoring.

creased commercial navigation with other economic, environmental, and recreational objectives, so it set up the EMP to address these needs.

Since 1986, the EMP has been funded at levels up to \$19.2 million per year. The EMP Coordinating Committee establishes priorities for projects that are completed with cooperation from state agencies. In Missouri, the Department of Conservation, charged with responsibility for fish and wildlife and forests, is the agency that works with the Corps on EMP projects, and provides a representative on the EMP Coordinating Committee.

The EMP was authorized by Congress for a period to end in 2002; a Report to Congress is in preparation, designed to summarize the accomplishments of the program, to evaluate the program's success in order to determine whether it should be extended.

“Partnership” is the key word in the EMP. As summarized in the EMP promotional brochure, “The five states and the Fish and Wildlife Service actively screen, recommend, and participate in developing habitat projects. Many projects involve state and local cost-sharing with the federal government, further emphasizing the partnership approach of the EMP. State biologists also staff the six Long Term Resource Monitoring Field Stations.”

Missouri has a field station at Cape Girardeau operated cooperatively with the Missouri Department of Conservation. Staff of the field station conduct regularly-scheduled water quality, fish and wildlife monitoring, and special studies.

Project Name	Status	Cost
Monkey Chute, MO	complete	\$ 56,000
Bay Island, MO	underway	2,530,000
Cottonwood Island, MO	design	3,324,000
Clarksville Refuge, MO	complete	454,000
Dresser Island, MO	complete	2,600,000
Pharris Island, MO	underway	2,783,000
Cuivre Island, MO	design	1,827,000
Pools 25/26, MO	design	1,187,000
Least Tern, MO	design	310,000
Norton Woods, MO	fact sheet	1,630,000
Stag Island, MO	fact sheet	2,250,000
Angle Blackburn, MO	fact sheet	696,000
		<u>\$19,647,000</u>

Table 3. EMP projects completed, underway, or planned in Missouri (1996 status).



Figure 28. The flood wall at Cape Girardeau held during the Great Flood of '93, protecting low-lying parts of the city from severe flooding. Photo by Jerry D. Vineyard.

5. MISSISSIPPI RIVER PARKWAY COMMISSION (MRPC)



MISSISSIPPI RIVER PARKWAY COMMISSION

MRPC at a glance.

State Members:

Arkansas
Iowa
Illinois
Kentucky
Louisiana
Minnesota
Mississippi
Missouri
Tennessee
Wisconsin
Ontario (Canadian Province)

Executive Director:

John F. Edman

Meetings:

Twice yearly; Mid-Winter and Annual Meetings.
Technical Committees meet separately as needed.

Dues:

\$7,500 per year.

Address:

Mississippi River Parkway Commission
Pioneer Building Suite 1513
336 Robert Street
St. Paul, MN 55101
(612) 224-9903; FAX (612) 224-9413

Congress created the Mississippi River Parkway Commission (MRPC) to develop the tourism resources along the Mississippi River by enlisting the cooperation of the states and Canadian provinces adjacent to the river. Specifically, the commission works collectively to **“preserve, promote, and enhance the scenic, historic, and recreational resources of the Mississippi River, to foster economic growth in the corridor, and to develop the national, scenic and historic parkway known as the Great River Road.”** The organization charges dues to each state, and operates with funds appropriated by Congress to carry out part of its work. The commission has a chairperson known as the Pilot, and maintains administrative offices with a small staff, in St. Paul, Minnesota.

MRPC operates with six technical committees: Transportation, Promotion, Historical/Archaeological/Cultural, Environmental/Recreation, Economic Development, and Agriculture. DNR’s River Basin Coordinator serves on the Environmental/Recreation Committee.

To carry out its responsibilities as a member state, Missouri has a parallel commission known as the Mississippi River Parkway Commission of the State of Missouri (RSMo 226.440-465). The Missouri commission is composed of nine members and assigned to the Dept. of Transportation for administrative purposes. Its purpose is to **“...aid in the promotion and securement of federal parks and a scenic parkway and highway for the state of Missouri along the Mississippi River. The commission shall work toward the planning, construction, maintenance,**

and improvement of the Great River Road and Mississippi River Parkway, which is to follow generally the course of the Mississippi River and extend from Canada to the Gulf of Mexico” (RSMo 226.440).

The Mississippi River Parkway legislation was amended via Senate Bill 715 in 1996, to reflect a bipartisan approach wherein four members are appointed by legislative leaders in the House and Senate, and five are appointed by the Governor.

In addition to the nine bipartisan members, the commission has as ex-officio members the director of the Dept. of Transportation, the director of State Parks, the director of the Dept. of Conservation, the director of the Dept. of Agriculture, and the director of the Dept. of Economic Development.

The MRPC, which is a 501(c) 3 non-profit organization, sought Congressional funding to produce a Mississippi River Corridor Study. Congress provided funds under PL 101-398, and a Mississippi River Corridor Study Commission (MRCSC) was formed under the aegis of the National Park Service to conduct the study. The MRCSC set up its own board of directors, with offices in Baton Rouge, Louisiana.

A draft Mississippi River Corridor Study in three volumes—Feasibility Report, and a two-volume Inventory of Resources and Significance, was released in August 1995. However, the report met widespread resistance because of the perception that it would lead to extensive acquisition of land by federal and state agencies, thereby eroding Congressional support for appropriations to complete the work. At this writing, the report remains in draft form, with no Congressional funding for completion.

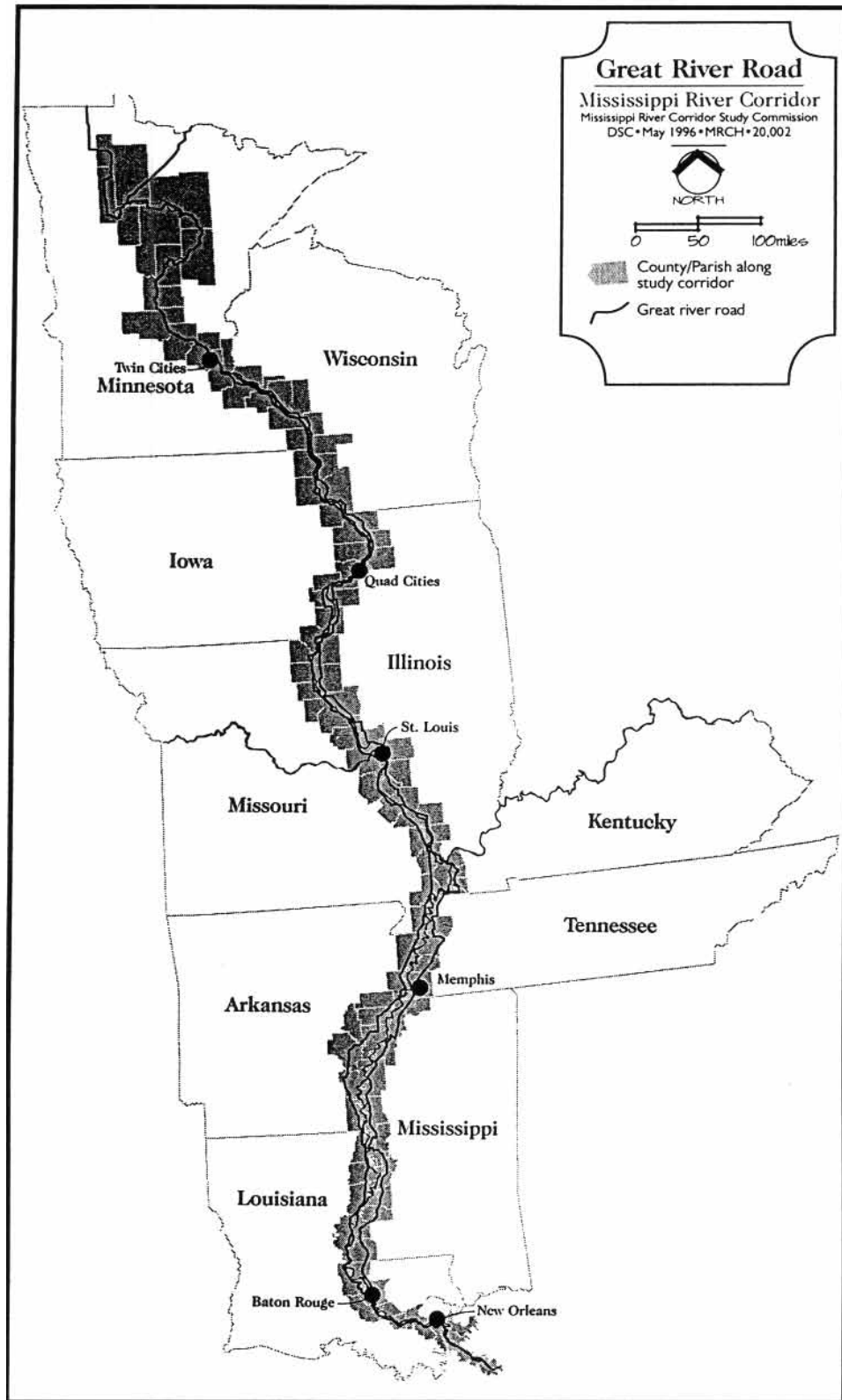


Figure 29. Mississippi River Corridor and Great River Road. From draft report of the Mississippi River Corridor Study.

INSTRUMENTS FOR INTERSTATE COOPERATION

There are numerous options for interstate cooperation, ranging from informal communication to elaborate interfaces having the force of law. Currently, river basin associations are the primary focus of Missouri's cooperative efforts with other states and federal agencies, but charters, compacts, and constituency groups have also been employed, or considered, from time to time.

1. River basin organizations: Based on drainage basin boundaries, these organizations characteristically address issues of mutual interest in a collaborative process that involves states, federal agencies, and various interest groups. Their activities do not attain the force of law, although their recommendations may become the basis for Congressional legislation. They are usually supported by dues paid by members, and their perpetuation depends entirely upon the members' willingness to participate cooperatively.

Some are relatively informal, with no dues structure and no permanent staff, relying on members to provide whatever administrative costs are required to keep the organization alive. Others have permanent staff, dues that require line-item legislative appropriations, and relatively frequent, regularly-scheduled meetings.

2. Interstate Compacts: Formal, highly structured, and administratively difficult, interstate water compacts are nevertheless one of the most frequently-used instruments to deal with the use and allocation of the waters of streams that cross state boundaries. Having the

force of federal law, the compacts define agreements between states that set forth how much water each state is entitled to, and under what conditions. Frequently employed in Western states, there are no water compacts involving the state of Missouri, although several attempts have been made to develop them.

COMPACT: (as a noun) to agree together; an agreement between two or more individuals, states, etc.

Agreements between states must be ratified by Congress, so there has developed a fairly standard procedure for negotiating compacts. Given a problem that affects two or more states, that seems amenable to the development of a compact, the following procedure may be followed:

- 1) States announce their intent to form a compact, and name official negotiators.
- 2) A federal agency, usually the Corps of Engineers, is named to preside at meetings of the compact negotiators.
- 3) When agreement is reached, it is drafted in the form of state legislation, which must have identical wording in each state legislature.
- 4) When identical legislation has been enacted in each state that is party to the compact, the compact must be ratified by Congress.

- 5) Upon ratification by Congress, the compact attains the force of law and the signatory parties develop a procedure and schedule for carrying out the provisions of the compact.

Negotiating interstate water compacts is likely to be a long and difficult process, requiring five to ten years of negotiations and legislative activity. It may be extraordinarily difficult to persuade individual state legislators to pass identical versions of the compact language; getting the document approved by Congress is usually much easier than getting the states to agree on the specific wording.

Standard procedure is not always followed in compact negotiations. In fact, past practice in Missouri has been to ignore the process and look for a quick solution.

Following are several examples of interstate compacts that were proposed involving interstate streams, but were never consummated:

1. **Missouri River Compact.** U.S. Representative Robert A. Young of St. Louis introduced legislation in Congress for a 10-state compact relating to the management of the Missouri River. Congressman Young's bill, introduced first in 1982 and again in 1983, would have established a Missouri River Interstate Compact Commission, charged with negotiating a compact to allocate the waters of the Missouri River among the 10 states in the basin. The bill did not specify any of the terms of the compact, only that the states should negotiate to agreement and then submit the document to each of the state legislatures and to Congress for ratification.

Despite newspaper accounts suggesting that a 10-state Missouri River compact was "flowing through Congress" (figure 30), the bill died in committee, and no similar bills have subsequently been introduced.

Young's proposed Missouri River Compact would have addressed the pollution issue by requiring that the agreement **"...ensure that any allocation of water made by such compact or agreement shall not cause deterioration in the water quality of any state of the Missouri River Basin and shall not reduce the navigational capacity of the Missouri River."**

2. **Mississippi River Interstate Pollution Phase-Out Compact.** Introduced in Congress by the Louisiana delegation in 1989, this legislation would have set up a 10-state compact commission that was to have negotiated an agreement to reduce the contaminant load of the Mississippi River. In the bill, "pollution" was defined as **"...any man-made alteration of water, resulting from the discharge of substances including but not limited to dredge or fill material, spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, biological material, radioactive material, heat, wrecked or discarded equipment, rock, sand, and cellar dirt."** Cellar dirt? Yes, whatever THAT is...

The proposal attracted little support and died in Congress. More recently, the state of Louisiana has become concerned about the so-called "Dead Zone," a region of low oxygen off the Mississippi delta in the Gulf of Mexico. More formally called the Gulf Hypoxia Zone, this is a phenomenon that appears during the summer season, waxing and waning in a manner similar to the "Ozone Hole" in the atmosphere over Antarctica. However, no proposal has yet been made to develop an interstate compact to deal with the hypoxia issue.

3. **Compact Between Iowa, Kansas, Missouri and Nebraska for the Development of the Missouri River for Barge Navigation.** The Missouri General Assembly passed, and the Governor signed, legislation that would have united the lower Missouri basin states in an effort to increase navigation on the Missouri River.

The legislatures of Missouri, Iowa, and Nebraska passed substantially identical legislation, but Kansas did not act, so the effort died. Missouri's bill had a sunset date of July 1, 1984; when that date passed, the effort ended; no subsequent legislation has been attempted (figure 31).

4. **Kansas-Missouri Stormwater Compact.** A Missouri legislator from the Kansas City area introduced legislation in the mid-1980s to foster cooperation between Kansas and Missouri in dealing with stormwater problems in the two Kansas Cities. The Missouri legislation was passed and signed by the Governor, but again, Kansas failed to act, and the effort failed.

Washington News

Bill setting up 10-state Missouri River compact flowing through Congress

by JOAN EDWARDS

WASHINGTON — Democratic Congressman Robert Young's bill to establish a 10-state compact to allocate the waters of the Missouri River is receiving remarkably swift attention by congressional committees responsible for moving the bill forward.

It has been referred from the Interior and Insular Affairs Committee to the subcommittee on water and power resources, and it is expected to go shortly to the U.S. Department of Interior for the administration's comment.

Young, of Maryland Heights, introduced a similar bill in October during the 97th Congress, with no hope of generating congressional action before the end of the session. He hoped the bill would stimulate congressional and state comments on his proposal. He got some adverse comments from upstream states and made some changes which he hopes will mollify the opposition to his proposed Missouri River interstate compact commission. He reintroduced the bill April 12.

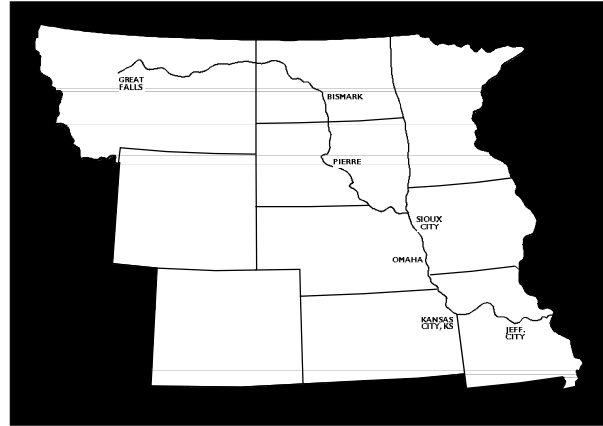
Young said he thinks there is an urgent need to move now on setting up the compact because, he said, "there is a proliferation of major proposals to divert Missouri River water."

"There is absolutely no question that future proposals will continue to plague the states in the basin," Young said. Any substantial diversion would drastically affect water transportation and vessel safety...drinking water supply, industrial use and commercial fishing activity."

In presenting his bill, the congressman said, "There are signs of an impending water crisis everywhere. It's estimated that in less than 20 years, every region of the country will confront severe water shortages unless we as a nation recognize that we cannot continue to waste and pollute our most precious life-giving commodity, water."

"Irrigation for the nation's farmers has almost tripled in the last 30 years. Ninety percent of the water in the west is used for irrigation, thus competing against the growth of our cities to use this water for drinking supplies, manufacturing and the production of critical energy resources," Young said.

Young said there are now 20 major interstate river compacts in the United States and the legislation he introduced is patterned after the recommendation made 30 years ago by the Missouri Basin Survey Commission, and endorsed



by Presidents Truman and Eisenhower.

The bill would provide for a compact commission composed of one member from each of the 10 Missouri River Basin states, to be designated or appointed by its governor with the advice and consent of the state senate. One member of the commission would represent the federal government and be appointed by the president. The commission would have the power to develop comprehensive policies for the integrated operation of relief, storage or diversion of the waters of the Missouri Basin.

The upstream basin states of Wyoming, South Dakota, North Dakota and Montana are very enthusiastic about this plan, because they don't want to give up their water which, in some cases, they can sell. But major diversions of river water could seriously affect downstream basin states such as Missouri, Iowa, Nebraska, and parts of Kansas. Colorado is considered to be a middle basin state. Minnesota is part of the basin, but only a small part.

Young has modified the language of his previous bill by deleting a provision to require that any water allocation made by the Missouri compact not cause deterioration in the water quality of any state in the basin and not reduce the navigation capacity of the river.

Jim Webb, of Young's office said, "Water engineers would be likely to say that the water quality or quantity would be affected by any change in flow, no matter how small."

The controversy over the allocation of river water has refocused over a much disputed plan to divert water for a coal slurry. The Energy Transportation Systems, Inc., (ETSI) of San Francisco appears to be making progress with its plan to build a coal slurry pipeline, using Missouri River water from

South Dakota and sending it to the coal fields of Wyoming. From there it would be transported to power plants in Oklahoma, Arkansas, Texas, and Louisiana. ETSI's project is just one of several plans to tap Missouri River water for industrial and agricultural uses. State and federal officials say the amount of water is very small, but believe the ETSI plan would set an important precedent. The state of South Dakota could earn as much as \$1.4 billion in the next 50 years over the sale.

Missouri, Iowa and Nebraska have filed a lawsuit which is now pending, to prevent this diversion.

Webb said another proposal to divert Missouri River water which came from a 1976 Department of Commerce study and recommended construction of a conduit running from Nebraska to New Mexico and Texas was "truly preposterous."

Estimated costs range from \$10-\$30 billion and it would divert half the flow of the Missouri River," Webb said.

The purpose of this project would be to provide irrigation for crops in states with insufficient water supply.

"There are crops that could be grown in those regions that don't need as much water," Webb said. "Probably, the crops that are now grown there would be more efficiently grown elsewhere."

Co-sponsors of Young's bill include Missouri Democrats Ike Skelton, Richard Gephardt and Harold Volkmer and Missouri Republicans Tom Coleman and William Emerson. Republican Congressman Douglas Bereuter of Nebraska is also co-sponsor.

"The concept of the Missouri compact would seem so important that it wouldn't be debatable," said Andy Duran of Young's office. "But opposition to it has once again reared its ugly

head."

This month, Sen. James Abdnor, R-South Dakota, omitted 10 Missouri and Iowa flood control projects from a \$7.5 billion water project bill. Abdnor, who chairs a water resources subcommittee of the Environment and Public Works Committee, is retaliating for Missouri's and Iowa's opposition to South Dakota's plan to divert river water for the ETSI slurry and a bill to allow a study of three additional Missouri River water projects.

But the slurry project is still going ahead and requests for right-of-way for pipeline the have been filed with the U.S. Forest Service. The House Interior Committee has approved the measure giving the pipeline company the right to take land necessary for construction.

Missouri's Sen. Jack Danforth "is unalterably opposed" to the coal slurry. He said it is a threat to the Missouri River."

He favors the Missouri basin compact as an ideal solution to the problem of how to manage the water, but feels it will take years to achieve it.

Interior Department spokesman Harmon Kallman said, "The administration favors the principles of the Missouri basin compact, if the states can get together. The administration favors states' rights."

Carroll Hammond, executive director of the Missouri Basin States Association, said, "The Association Board of Directors have not met since Young's bill has been reintroduced with the deletion of one section that was particularly offensive to upstream basin states."

"Some states," said Hammond, "believe there is no need for this bill — not yet, or in the foreseeable future...and possibly the deletion of that section won't change their mind." But he feels there is a "need to get together and exchange a lot of information on an ongoing basis."

"The Missouri basin compact legislation is premature," Wyoming's state engineer, George Christopolous, said. "The states are not ready to compact water and they should be allowed to look at the legislation."

Charles Michael of the Missouri Department of Natural Resources said, "The state is in favor of a wide plan of attack on this issue, but given the differences of opinion among the various states, it will be 20 years in coming to reality."

Figure 30. Missouri River Compact flows through Congress.

BARGES

237.400. Interstate compact for barge traffic development on the Missouri River with Iowa, Kansas, Missouri, Nebraska.— Within sixty days of September 28, 1983, the governor shall act to enter into a compact with the states of Iowa, Kansas and Nebraska to read substantially as follows:

COMPACT BETWEEN IOWA, KANSAS, MISSOURI AND NEBRASKA FOR THE DEVELOPMENT OF THE MISSOURI RIVER FOR BARGE TRAFFIC

ARTICLE I

The purposes of this compact are to provide for planning for the most efficient use of the waters of the Missouri River to increase the amount of barge traffic on that segment of the Missouri River which flows between and within the compact states, to take necessary steps to develop the Missouri River and its banks to handle more barge traffic than is presently handled, to encourage the use of barges on that segment of the Missouri River for transporting bulk goods, especially farm commodities, to insure that the intended increase in barge traffic does not impose unacceptable damage on the Missouri River in all its various uses, including agriculture, wildlife management, and recreational opportunities, to consider the diversion of the waters of the Missouri River as it affects navigation, and to promote joint action between the compact parties to accomplish these purposes. The purposes of the compact do not include lobbying activities against user fees for barge traffic and such activities under this compact are prohibited.

ARTICLE II

It is the responsibility of the four states to accomplish the purposes in Article I through

the official in each state who is charged with the duty of administering the public waters and to collect and correlate through those officials the data necessary for the proper administration of the compact. Those officials may, by unanimous action, adopt rules and regulations to accomplish the purposes of this compact.

ARTICLE III

The states of Iowa, Missouri, Kansas, and Nebraska agree that within a reasonable time they shall fulfill the obligations of this compact and that each shall authorize the proper official or agency in its state to take the necessary steps to promote the use of barges and develop the Missouri River as it flows between and within the compact states for greater amounts of barge traffic.

ARTICLE IV

This compact does not limit the powers granted in any other act to enter into interstate or other agreements relating to the Missouri River flowing between and within the compact states, alter the relations between the respective internal responsibilities of the government of a party state and its subdivisions, or impair or affect any rights, powers, or jurisdiction of the United States, or those acting by or under its authority, in, over, and to those waters of the Missouri River. The adoption of this compact by the general assembly shall not require the state of Missouri to adopt any legislation or to appropriate funds for its implementation.

ARTICLE V

Unless this compact is entered into on or before July 1, 1984, the governor shall take no further action to secure the compact.

(L. 1983 H.B. 102 & 1)

Figure 31. The Missouri River Barge Navigation Compact (RSMo chpt. 237.400, p. 2356) passed the Missouri Legislature and was signed by the Governor, but failed to gain acceptance from the other three states.

5. Kansas-Missouri Interstate Streams Compact. In the late 1970s and early 1980s, the Missouri DNR and the Kansas Water Office began negotiations toward an interstate compact involving the streams that cross the Kansas-Missouri border. Missouri interests, in particular the City of Nevada, were concerned about the reliability of flows in the Marmaton River (figure 32), which they hoped to use to augment their water supply. Kansas, on the other hand, was interested in the Spring River, which flows from Missouri into Kansas, and in certain issues relating to groundwater pumping.

Negotiations continued for several years, with both sides compiling data and discussing options. The matter was considerably complicated by the fact that Missouri uses the Riparian Doctrine, while Kansas is a Prior Appropriation state. A major issue was the fact that Kansas can and does issue permits for water use, while Missouri does not. Kansas questioned wheth-

er, if a compact were to be negotiated, Missouri could guarantee performance in the absence of any water rights laws.

Riparian Doctrine: The concept of water rights whereby the owner of land along a watercourse is entitled to “reasonable use” of the water in the stream. The riparian doctrine in itself does not convey water rights per se. In fact, Missouri has no water rights legislation; conflicts are dealt with on a case-by-case basis through the courts.

Prior Appropriation Doctrine: The concept of water rights commonly described as “first in time, first in right.” This doctrine is the norm in many Western states, where water is frequently in short supply. States that use the prior appropriation doctrine typically develop water rights statutes that rigidly apply the principles to both water in streams and groundwater.



Figure 32. The Marmaton River is reduced to a trickle at the state line during dry years. Kansas, a prior appropriation state, has the potential to issue permits to consume all of the available water before it reaches Missouri. Photo by Jerry D. Vineyard.

The informal discussions continued for several years, toward the point where a Compact Commission would be formed and actual bargaining would begin. Unfortunately, election of a new governor in Kansas replaced the director of the Kansas Water Office, so the continuity was lost and the compact discussions fell by the wayside. Since then, no further attempts have been made to reinstitute compact negotiations.

Another interstate issue was the proposed construction of the Fort Scott Dam, a Corps of Engineers project set for the Marmaton River, some 20 miles upstream from Nevada, Missouri, in Kansas. Questions arose about how much water would be released from the dam, and whether Kansas could issue permits for the use of all available water in the stream before it reached the Missouri state line. To have been successful, the compact would have had to address these difficult issues, which would have taken a great deal of time and effort, probably including the passage of some sort of water rights legislation for Missouri, that would have enabled the state to guarantee the terms of the compact.

6. Missouri-Arkansas Interstate Stream Compact. During the mid-1980s DNR became involved in negotiations with the state of Arkansas toward a compact covering streams that cross the Arkansas-Missouri boundary. With the exception of the White River, which flows into Missouri from Arkansas, then back into Arkansas, streamflow is from Missouri into Arkansas, giving Missouri the advantage in negotiations.

Arkansas has existing compacts with other states, and felt that a compact with Missouri would be advantageous for both states. Preliminary negotiations went on for some time, but the negotiations ended before agreement had been reached. Since then, no further efforts have been made by either state to resume negotiations.

7. Charters.

CHARTER: noun. 1 a franchise or written grant of specified rights made by a government or ruler to a person, corporation, etc. 2 a document setting forth the aims and principles of a united group, as of nations.

UPPER MISSISSIPPI RIVER BASIN CHARTER

Signed by the five Governors of the Upper Mississippi River Basin in October, 1989, the Upper Mississippi River Basin Charter sets forth principles for the management of the basin's water resources, and guidelines for notification and consultation among the signatory states.

The purposes of the Charter are **"...to conserve the levels and flows of the water resources; to protect the environmental ecosystem; to secure present development; to provide a foundation for future investment and development; and to assure all significant benefits and impacts are considered before a decision is made."**

The Charter has four Principles: 1) Integrity of the Upper Mississippi River Basin; 2) Notification and Consultation; 3) Cooperation Among States; and 4) Reservation of States Rights.

The centerpiece of the Charter is a requirement that **"Any state having knowledge of a proposal for a new or increased diversion of water which will exceed 5 million gallons per day average in any 30-day period from the waters of the Upper Mississippi River Basin to another basin shall notify and offer to consult with all signatory states in order to allow signatory states to express their concerns, identify their interests, develop where possible mutually acceptable agreements, or take such other actions as they may find appropriate."**

In short, the Charter commits each state to tell the others when they plan to use over five million gallons of water per day for any new purpose. The Charter recognizes the rights of states to use Mississippi River water, but it introduces the matter of courtesy and provides a way to avoid surprises and possible lawsuits.

The Charter was developed through the Upper Mississippi River Basin Association, but it is not the same as the UMRBA. However, each state reports its Charter activities—or lack of them—at the annual meeting of the UMRBA. Since the signing of the Charter in 1989, no significant diversions have been reported.

THE SIGNIFICANCE OF INTERSTATE STREAMS

Streams that cross state boundaries contribute a significant share of the water available for use in Missouri. The majority of such streams flow from other states into Missouri, but some flow from Missouri into other states. When a stream crosses the border bringing water into the state, it is subject to depletion by the donor state before it reaches Missouri. If a Missouri stream crosses into another state, we have the advantage—absent an interstate water compact—of using as much water as we please before it reaches the border. Moreover, we can degrade the quality of the water as much as we like, within limits set by instate standards, before it passes into the adjacent state.

Unfortunately, more streams flow into Missouri than flow out of the state. Why is this not fortunate? It is, up to a point; but if neighbor states deplete the water flow before it reaches Missouri, then we have a net loss that may be extremely difficult to recover.

EXAMPLE: Marmaton River Basin, Kansas and Missouri.

The Marmaton River rises in southeastern Kansas and flows for some 40 miles through that state before it reaches the Missouri border, just west of Nevada, Missouri. From the border it flows generally northeastward to the Little Osage River. Ultimately the Marmaton helps fill Truman Lake, contributing to fish, wildlife, and recreation, and power generation through the turbines of Truman Dam.

Missouri is a riparian state, meaning that people who live along the river are entitled to use reasonable amounts of water from the

river. Kansas, though, is a prior appropriation state; residents must obtain permits to use specific amounts of water that are determined by the prior appropriation doctrine, which in its simplest form, means “First in time, first in right.” Absent an interstate compact that allocates shares to each state, Kansas is free to grant permits to its citizens to use ALL of the water of the Marmaton River before it reaches the state line.

The situation is compounded by the fact that Kansas has much lower annual precipitation than Missouri; water is simply more precious in Kansas than it is in Missouri.

Many years ago, the Corps of Engineers proposed to build a dam on the Marmaton River in Kansas, to be called the Fort Scott Dam. It would have impounded a lake entirely in Kansas, and subject to that state’s water laws. The risk in such a situation is that the impounded water becomes attractive to water importers—such as cities and irrigation districts—that may want to move the water out of the basin, thereby depriving downstream users of the use of the water.

Unfavorable political and economic conditions have prevailed since the dam was first proposed, and there are no current plans to build it. However, it remains on the list of projects authorized for the Corps to build, should the situation change.

All of the streams crossing the Iowa-Missouri border flow from Iowa into Missouri, but Iowa is also a riparian state, and it has annual precipitation more like that of Missouri.

<i>INFLOWS</i>	<i>acre feet</i>	<i>OUTFLOWS</i>	<i>acre feet</i>
<i>From Kansas:</i>		<i>To Kansas:</i>	
Kansas River	3,302,100	Spring River	275,400
Blue River/Indian Creek	38,000	Center Creek	79,500
Marais des Cygne River	815,900	Shoal Creek	99,800
Little Osage River	80,400		
Marmaton River	93,300	<i>To Oklahoma:</i>	
West Fork Dry Wood Creek	34,700	Lost Creek	12,700
		Buffalo Creek	17,900
<i>From Iowa:</i>		Elk River	152,500
Chariton River	160,300	Honey Creek	3,100
Des Moines River	2,902,900		
East Fork Grand River	19,300	<i>To Arkansas:</i>	
East Fork 102 River	21,800	Upper Table Rock; James	
Fox River	36,800	Upper Bull Shoals	1,764,500
Grand River	40,200	North Bull Shoals Tributary	88,300
Honey Creek	10,500	Little North Fork	172,900
Little River	20,200	North Fork White River	783,000
Lotts Creek	12,600	Lower Norfork Lake Tributary	52,600
Nishnabotna River	561,900	South Fork Spring River	59,000
Nodaway River	231,800	Middle Spring River	70,100
Platte Branch	9,900	Upper Spring River	139,900
Platte River	54,200	Eleven Point River	605,200
Shoal Creek	14,200	Fourche Creek	67,800
South Wyaconda River	10,600	Current River	1,295,900
Tarkio River	40,200	Little Black River	215,500
Thompson River	143,000	Black River	1,052,600
West Fork 102 River	41,300	Cache River	27,600
West Tarkio Creek	18,500	St. Francis River	1,134,100
Weldon River	46,500	Little River Ditch	1,199,100
		Buffalo Ditch	72,500
<i>From Arkansas:</i>			
Honey Creek	11,100		
Elk Creek	25,200		
Upper Little Sugar River	81,200		
Sugar Creek	25,800		
White River	756,700		
Kings River	333,600		
Indian Creek	22,300		
Long Creek	163,300		
Bull Shoals Lateral	248,500		
<i>Total Inflow From Other States</i>	<i>10,428,800</i>	<i>Total Outflow to Other States</i>	<i>9,191,500</i>

Source: U.S. Natural Resources Conservation Service, unpublished data prepared in support of Missouri State Water Plan. Harold Deckerd, 1995.

Table 4. Water resource gains and losses on border-crossing streams.

Therefore, the potential for competition for available water is less critical than it is with the state of Kansas. Moreover, Iowa has extensive rural water systems that in a few cases service communities in Missouri.

Missouri's border with Oklahoma and southeastern Kansas features several streams that flow from Missouri into Kansas and Oklahoma, and thence into Grand Lake 'O the Cherokees. Water quality is probably the primary consideration in water relationships between Missouri, Kansas and Oklahoma. Extensive underground metal mining in what was known as the Tri-State Zinc-Lead District of Missouri, Kansas and Oklahoma through a period of more than a hundred years left a legacy of abandoned, water-filled mine workings and extensive mine tailings piles on the surface. Mining began near Joplin in 1839 and progressed into nearby Kansas and Oklahoma.

The last mine in the District closed in 1972. Pumps that had been pumping groundwater out of the mines to keep them dry, were turned off, and the mines slowly filled with water. Some of the old mine shafts now overflow, functioning very much like springs. And, there are some exploratory drillholes that were never plugged, that now are flowing wells. The water quality in some of these pseudo-springs and flowing wells is of

poor quality. The problem is most serious in Oklahoma, which is down-gradient from most of the abandoned mines.

The problem is exacerbated by the fact that most of the old mines were interconnected, making it nearly impossible to isolate and control a specific problem well or spring.

Another interstate water issue related to river basins is the problem of groundwater overpumping along state borders. One example involves the city of Miami, Oklahoma, which obtains its municipal water supply from deep wells drilled into bedrock. Heavy pumping of these wells has depressed the water table in adjacent parts of Missouri, causing concern about "taking" of Missouri groundwater resources. Other states have addressed similar problems with interstate compacts, but even these do not always work as they are designed to do, leaving litigation in the U.S. Supreme Court as a last resort.



Figure 33. Abandoned zinc-lead mines in the Tri-State District in Missouri, Kansas and Oklahoma are now water-filled and the source of interstate water quality problems. Photo by Jerry D. Vineyard.

THE CANNON WATER CONTRACTS

A CASE STUDY OF STATE WATER PLANNING

INTRODUCTION

The Mississippi River Basin is noted for major water projects of great value. In Missouri on the Salt River, tributary to the Mississippi, the award-winning Clarence Cannon Wholesale Water Commission is now delivering abundant high-quality drinking water from Mark Twain Lake to farm families, municipalities, and commercial customers in northeastern and north-central Missouri. Long-term and steadfast state water planning for this project began more than 30 years ago. The outcome has been an outstanding example of water resource sharing of hydropower, flood protection, recreation and water supply for the public and private sectors.

This case study of water planning details the activities of state government working through a succession of governors toward a common goal of providing a safe and reliable water supply to a part of the state where both surface and groundwater supplies have historically been inadequate and in many areas, unsafe.

This was accomplished first by forward-looking water planning that led to the Corps of Engineers' construction of a dam named after the late Congressman Clarence Cannon (figure 34).

The completed project created a water source—the Mark Twain Lake—that includes storage for a guaranteed reliable water source for 98 out of 100 years, providing up to 16 million gallons of water per day. The final phase of this initiative was the funding and construction of a large water treatment plant and distribution lines. Raw water from the lake is processed in the new, state-of-the-art Cecil V. Fretwell water treatment plant and distributed throughout a multi-county area with development costs financed by a local bond issue. This completed the state-federal-local alliance that made the entire system possible.

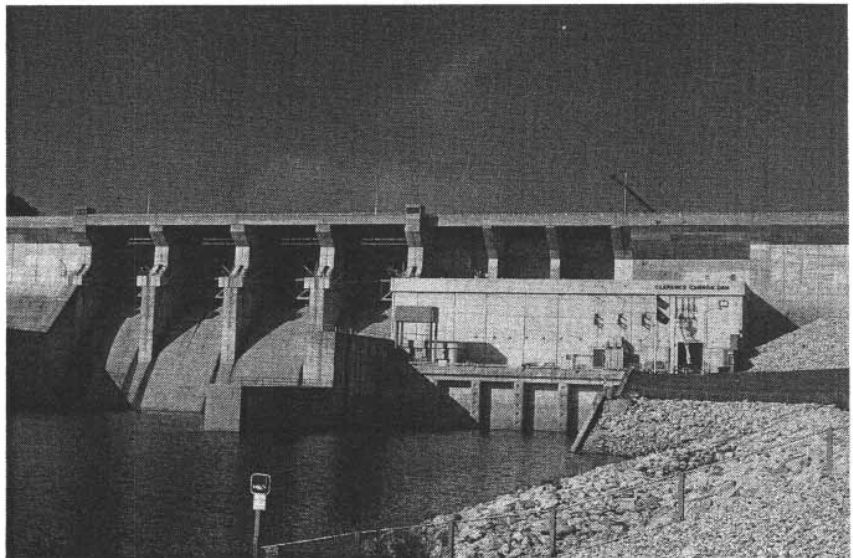


Figure 34. Clarence Cannon Dam, Salt River, western Ralls County, Missouri. Completed on January 8, 1984, the dam provides water-supply storage sufficient for many years into the future. Photo by Jerry D. Vineyard.

THE EARLY YEARS

Large and successful water projects are years in the making and come to fruition only after consistent and well thought out water planning has taken place. The story of the Cannon Water Contracts begins in the 1930s, when Congress passed the Flood Control Act of 1938, which provided for a single-purpose, flood-control dam near Joanna, Missouri. Congress wanted to stop the devastating flooding that had plagued farmers for many years. However, the greater flooding problems on the Missouri River had higher priority, and no progress was made toward building the Joanna Dam—as it was known at that time—until the 1950s.

A heated debate between supporters and opponents of the dam raged for several years until the supporters gained the upper hand by recasting the dam as a multi-purpose structure. Eventually, hydropower generation, flow support to Mississippi River navigation, recreation, and water supply would be counted among the benefits to be realized by building the dam. Gradually the pendulum swung toward dam supporters, who gained the backing of long-time U.S. Representative Clarence Cannon of Elsberry, and then U.S. Senator Stuart Symington. Their support, of course, was absolutely essential if the project was to receive federal funding.

Years of controversy between supporters and opponents and concurrent hydrologic and economic studies by the Corps of Engineers took place in the 1950s, but in the early 1960s it seemed probable that Joanna Dam would be built. It was in this period that joint state and Corps of Engineers geologic investigations were conducted, and the preferred dam site was selected. At this point it also became necessary for the State to decide what position it would take. For example, the State Park Board moved to ask the Corps to replace State Park lands that would be flooded by the lake. On balance, the Board favored construction of the dam, seeing it as an investment in future recreational opportunities for Missourians. The Missouri Department of Conservation, however, formally opposed the dam because of their commitment

to stream resources rather than to artificial lakes. Meanwhile, the Congress authorized the Joanna Dam project in 1962 at an estimated cost of \$63,300,000. The legislation was signed by President John F. Kennedy.

STATE WATER PLANNING BEGINS

Congress had earlier passed legislation known as the Water-Supply Act of 1958, which made it possible for non-federal partners to participate with the Corps in the planning and building of water projects in exchange for repayment of the costs over a 50-year period. The state legislature reacted to the Congressional initiative by creating the Missouri Water Resources Board in 1961. Clifford Summers became its director. . Governor John M. Dalton became the first in an uninterrupted succession of governors to support the project. At the same time, the Missouri Legislature passed a resolution supporting the dam.

The State Water Resources Board was charged to **“...develop a plan for a gradual, long-range comprehensive state-wide program for the conservation, development, management and use of the water resources of the state.”** In 1963, the Missouri House passed a resolution requiring the Water Resources Board to consider the question of non-federal sponsorship of water-supply costs of the project, setting a 1965 deadline.

Congressman Clarence Cannon died of a heart attack on May 12, 1964, prompting Congress to rename Joanna Dam in honor of the long-time Missouri representative who had become its champion. The lake impounded by Cannon Dam would be named in honor of Mark Twain, whose birthplace is preserved in Mark Twain State Park adjacent to the lake.

The Water Resources Board essentially followed the 1938 State Water Plan that emphasized the need for surface water impoundments to provide water supply in some parts of the state. The Board took advantage of the benefits offered by the Water Supply Act of 1958 by writing “Water Assurance Letters” to the Corps of Engineers, pledging to repay federal costs incurred in the construction of water projects. Several such letters were prepared, covering

water-supply storage in Mark Twain Lake as well as in Long Branch Reservoir, some 80 miles to the west in the Missouri River Basin, and several other projects that were never built, such as the Meramec Park Dam, on the Meramec River in the south-central part of the state. Several of the other proposed dams for which water assurance letters were written, were never built, largely because of environmental concerns.

The Corps of Engineers accepted these letters as assurance that the State would back up its commitment with appropriations on the completion of the dams. To lend credibility to the letters, which were signed by the members of the Water Resources Board, the Legislature set up a special fund known as the Water Development Fund. Annual appropriations were to be made into the fund during the time of construction of the dam, so that when the bill came due, there would be money in the bank to pay it. Unfortunately, regular appropriations were not made into the Fund, and previ-

ously deposited funds were spent for other purposes, so it has not functioned as it was designed to do. The reasons why continuing deposits have not been made is not entirely clear, but it probably has much to do with the priorities that tend to develop within each legislative session.

CONSTRUCTION OF CANNON DAM

Ground-breaking for Cannon Dam took place on September 21, 1968, but it would be 16 years before the project would be declared complete. Every year brought new competition in Congress for project funding. Fortunately, the project enjoyed bipartisan support, so funds continued to be appropriated, even as project costs escalated. A succession of problems plagued the work, and as the years passed, inflation pushed the costs ever higher. On one occasion, a flood washed away much of the preliminary work, causing a virtual restart on earthmoving. Labor strife delayed the work on several occasions (figure 35).



Figure 35. Clarence Cannon Dam under construction. View is from the south abutment of the dam, looking north. The lake side of the dam is to the left. The massive structure on the right is the powerhouse and outlet works. Photo by Jerry D. Vineyard.

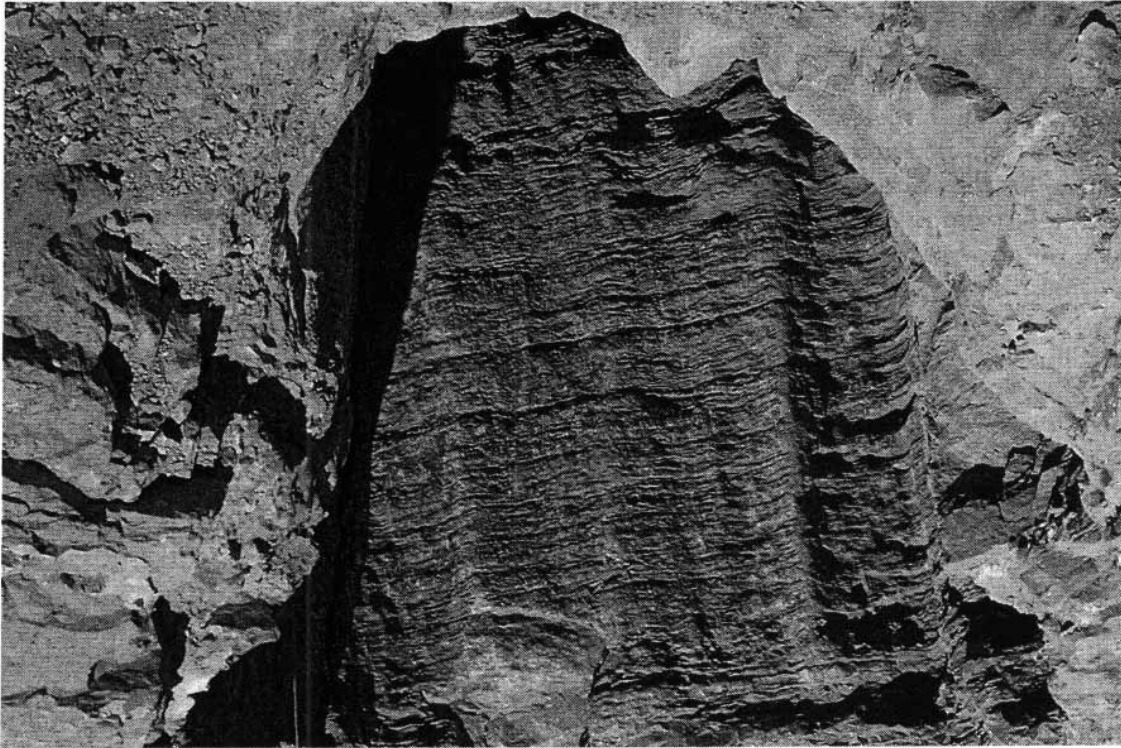


Figure 36. Open, vertical shaft in limestone bedrock, exposed during construction on the north abutment of Clarence Cannon Dam. Geologic problems such as this one, discovered late in the construction phase, added considerably to the cost of the project. Photo by Jerry D. Vineyard.

Late in the construction period, unexpected geological problems surfaced that required expensive remedial measures. Test drilling on the north abutment of the dam revealed a series of openings that had been dissolved in the limestone bedrock by groundwater. These were in essence vertical caves that had previously had no openings to the surface; they were revealed only by late-stage drilling. Correcting the problem required expensive, meticulous excavation of the sediment filling the caves, after which the openings had to be refilled with concrete. If these openings had not been discovered, the lake might have been catastrophically drained and the costs of correcting the problems would have been enormous. Geologists from DNR's Division of Geology and Land Survey were called in by the Corps to help devise a plan to deal with the geological hazards.

By the time the project was complete, the cost had escalated from \$63.3 million to over

\$364 million, an increase attributed to inflation over a 20-year period, labor strife, damaging floods, and other unforeseen expenses.

Strong support for the project from Missouri's Congressional delegation, all governors since Dalton, and the Missouri Legislature insured that the construction would continue in spite of the increasing costs. Part of the added costs would have to be shared by the State, which had committed to repaying the costs of water-supply storage to be incorporated into the project.

Finally, on January 8, 1984, the Corps announced that the Clarence Cannon Dam was complete. In addition to having protection from downstream flooding, northeastern and north-central Missouri now had a new hydro-power plant, a recreational lake with new State Park facilities, and 20,000 acre-feet of water-supply storage to meet public and private needs. All this in a part of the state where groundwater supplies are very small and of poor quality.

MAKING THE PLAN A REALITY

While the Corps of Engineers was building Cannon Dam, the State was having organizational problems of its own. Too many autonomous agencies reporting directly to the governor brought a crippling inefficiency to State government. The Executive Branch was reorganized in 1974 into a cabinet structure with 14 departments. More than 80 separate agencies gave up their autonomy to become parts of the new departmental structure.

The Missouri Water Resources Board was eliminated, but the Board's powers and duties related to water planning were transferred to the Department of Natural Resources, ultimately residing with the Division of Geology and Land Survey in Rolla, which earlier had been known as the Missouri Geological Survey and Water Resources. To carry out these responsibilities, the Division formed a new Water Resources Program. One of the first tasks of this program was to deal with the responsibilities imposed by the Water Assurance Letters given legitimacy by the Water Resources Board.

Late in the construction of Cannon Dam, the Department of Natural Resources realized that a major marketing effort would be needed to distribute and sell the water it would soon gain title to. It seemed prudent to consider economies of scale rather than looking toward numerous water intake structures in the lake, each devoted to supplying the water needs of a relatively small constituency.

So legislation was developed to modify the existing municipal corporation statutes to enable the formation of Wholesale Water Districts. The late state senator Norman Merrell, recognizing the potential social and economic benefits of water to his district, and thus to all of Missouri, sponsored not only the wholesale water districts legislation but other needed legislation as well. In 1983, the Legislature passed HB 204 [RSMo Chpt. 393.710-770], enabling the formation of wholesale water districts to market water efficiently from large reservoirs.

Reacting quickly, residents in the Mark Twain Lake area, under the leadership of Cecil V. Fretwell, organized the Clarence Cannon

Wholesale Water Commission under terms of the 1983 legislation (figure 37). Their sole purpose was to acquire and market water from Mark Twain Lake.

Early in 1984 the Corps of Engineers sent a letter to the State of Missouri informing the State that the Cannon Dam was complete and the bill for repayment of the costs of water-supply storage under the Water-Supply Act of 1958 was now due and payable. But first, said the Corps, a contract would have to be negotiated and signed.

The Department of Natural Resources responded by forming a negotiating team headed by Jerry D. Vineyard, who enlisted the aid of Assistant Attorney General Robert Lindholm; Jerry Lane, Director of DNR's Public Water Supply Program; and Steve Decker, Regional Administrator of DNR's Division of Environmental Quality's Macon office. He also brought in Cecil V. Fretwell, Chairman of the Clarence Cannon Wholesale Water Commission, which was perceived as the primary customer for the water. The negotiating team began its work in 1984, and final contracts were signed in 1988.

While negotiations were underway, other details had to be worked out. Preliminary designs for the water intake structure and the water distribution lines required easements for crossing State Park lands with water lines, so the Legislature had to pass legislation (H.B. 1600, 1986) to allow that to happen. And, certain tax advantages were necessary to the efficient operation of the wholesale water district, so more legislation (S.B. 488, 1986) was required.

THE CANNON WATER CONTRACTS

The Corps and the State negotiating team were breaking new ground; this was the first situation in Missouri where the Water-Supply Act of 1958 was involved. The objective was to transfer title to the State for 20,000 acre-feet of water-supply storage, which the Corps estimated would provide up to 16 million gallons of water per day, with a reliability of 98 years out of 100. It is important to remember that water-supply STORAGE is involved, not the water itself. This is analogous to buying a

CLARENCE CANNON WHOLESAL WATER COMMISSION

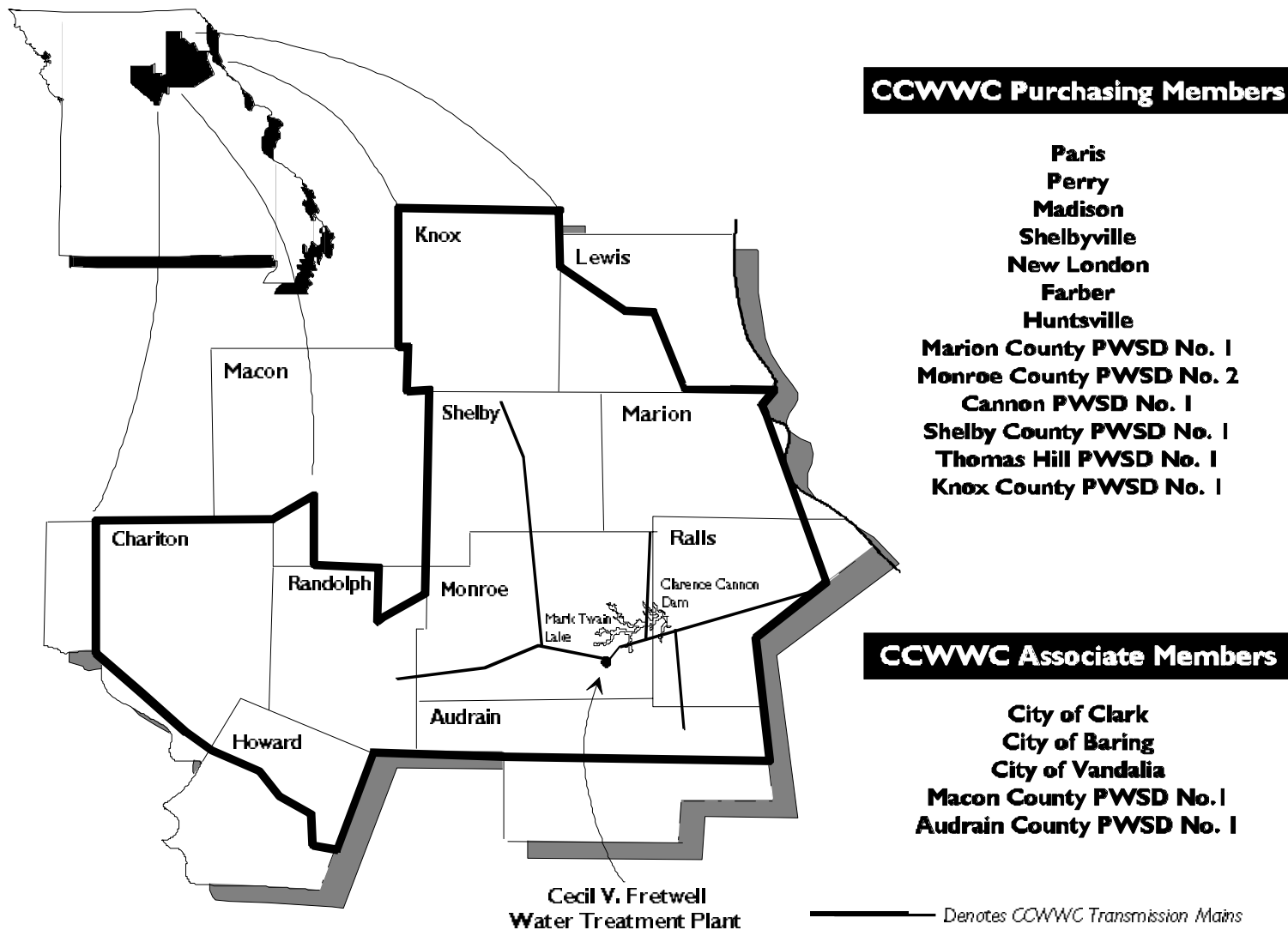


Figure 37. Service area for the Clarence Cannon Wholesale Water Commission. Water mains owned by the Commission connect with customer-owned lines in cities and rural water districts. Drawing from CCWWC's 1995 Annual Report.

bucket, which can then be filled and emptied as many times as one wishes. In this case, Mark Twain Lake is the “bucket,” from which water is drawn out through the intake structure and replaced by inflow into the lake from the Salt River and its tributaries. As long as the “bucket”—Mark Twain Lake—holds water, up to 16 million gallons per day is available for use (figure 38).

The cost of the water-supply storage is based on a formula contained in the Water-Supply Act, which also sets the terms of the repayment. Briefly, the non-federal entity must pay approximately five percent of the cost of the project, which had escalated to more than \$360 million by the time construction was complete. The repayment terms, however, were quite generous. The interest rate was set at 3.22 percent, which seemed an incredible bargain, given prevailing mortgage interest rates of up to 15 percent at the time. The non-federal entity would have 50 years to repay the cost, and 10 years of that would be an interest-free period, giving time for construction of appropriate marketing facilities.

Only the State could qualify for these favorable terms, because the State had earlier signed a Letter of Assurance, promising to pay 100 percent of the cost of including 20,000 acre-feet of water-supply storage in the design of Cannon Dam. In order to bring the Clarence Cannon Wholesale Water Commission into the picture, the State suggested—and the Corps accepted—the concept of transferring part of the State’s share of the water-supply storage to the CCWWC. This was ultimately done by developing two contracts: the Three-Party Contract, between the Corps, the State, and the CCWWC, and the Two-Party Contract, between the Corps and the State. The Three-Party Contract would transfer part of the State’s share to the CCWWC, but title to the water would revert to the State in case of default by CCWWC. The Two-Party Contract would cover the remaining storage, which would remain under the control of the State.

The main reason for developing two contracts was to reduce the overall costs to CCWWC,

and relieve the State of costs related to administering the contracts. In effect, the State avoided becoming a permanent broker for water from Mark Twain Lake.

While negotiations were underway between the Corps, the State, and CCWWC, Congress passed the Omnibus Water Act of 1986, which drastically changed the terms of water-supply storage repayment. Instead of 3.22 percent interest and a 50-year payback with a 10-year interest-free period, the new rules specified interest at market rates, a 30-year payback, and no interest-free period. Needless to say, this would have greatly increased the costs, so the State and CCWWC appealed to then-Senator John C. Danforth, who intervened by getting the Corps to concede that “substantial agreement” had been reached in the negotiations, allowing the process to continue under terms of the 1958 law.

Finally, in the spring of 1988, the negotiations were complete, and the Cannon Water Contracts were signed in a special ceremony at Cannon Dam Visitor Center. Governor John Ashcroft signed for the State, Assistant Secretary of the Army Robert Page for the Corps, and Cecil V. Fretwell for the CCWWC. In addition, DNR Director Frederick Brunner signed as the administrator for the abolished Water Resources Board, which had originally developed the concept of buying water-supply storage as a part of the Cannon Dam project.

The impact of this precedent-setting process is difficult to underestimate. For the first time since early settlers came to north-central and northeastern Missouri, the region has a safe and abundant water supply, nearly drought-proof, and sufficient to last far into the 21st century. The cost is less than it would have been under nearly any other scenario, thanks to state water planning work that began in the early 1960s. Moreover, the cost to the consumer will go DOWN in the future, not UP! Once the cost of water-supply storage is paid—by the year 2034 or earlier—the only cost will be a share of the Corps’ operation and maintenance costs for keeping the dam in operation.

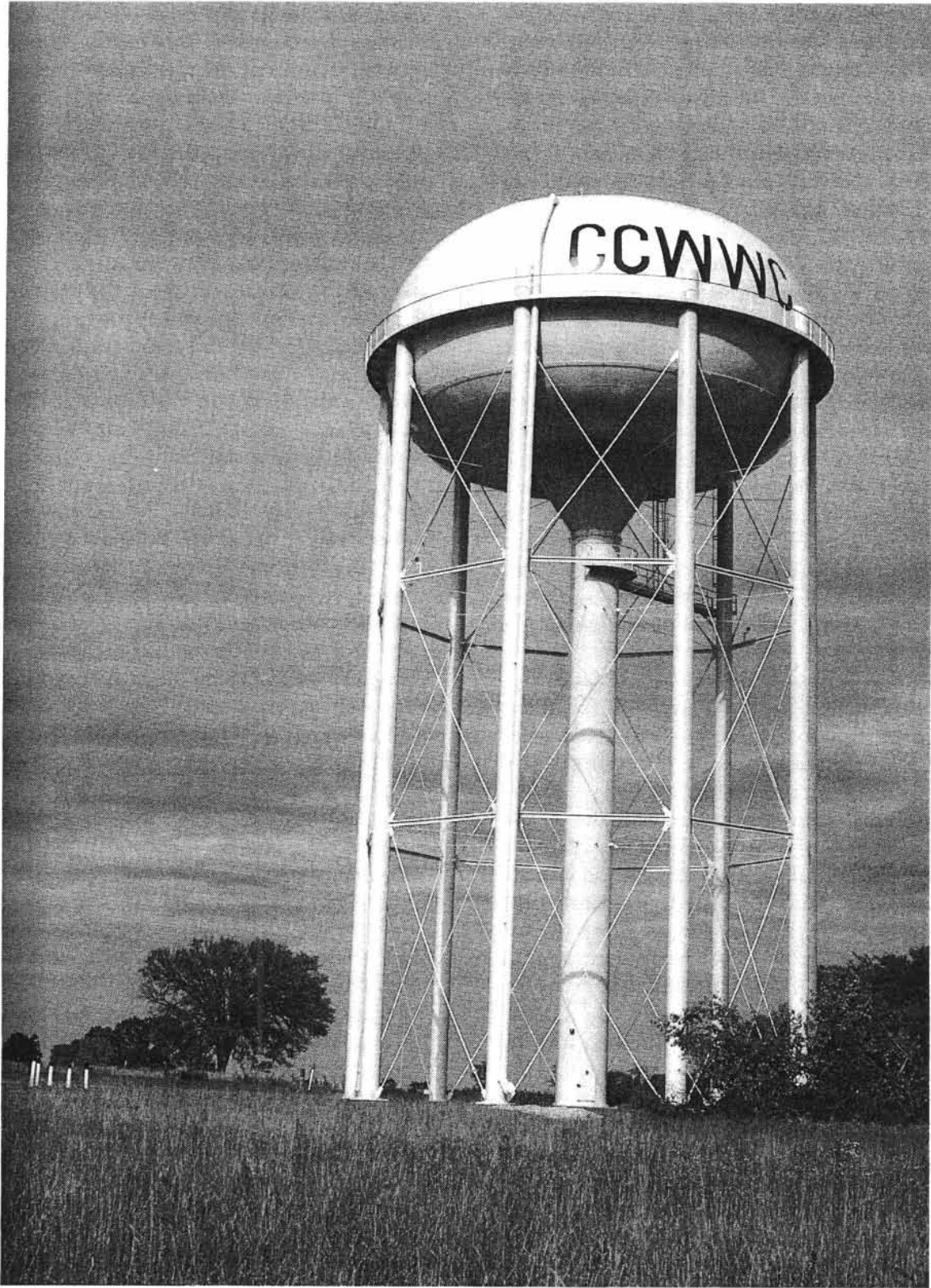


Figure 38. Clarence Cannon Wholesale Water Commission's one million gallon water tower is a visible symbol of a new era of plentiful water in northeastern Missouri thanks to state water planning and local, state and federal cooperation. Photo by Jerry D. Vineyard.

BUYING AND SELLING WATER

While the contract negotiations were underway between 1984 and 1988, the officials of the CCWWC had to overcome some formidable obstacles. First, they had to sell potential members/customers on the wisdom of becoming party to contracts between the State and the Corps of Engineers, a tall order in a region where the intentions of government are often suspect. Once over that hurdle, the next one was equally formidable: obtaining funding to build a water treatment plant and install distribution lines to deliver finished water to far-flung customers. The third hurdle was no less daunting: actually building and operating the water treatment and distribution system.

Thanks to sufficient public involvement and assurances by political leaders such as Senator Norman Merrell at the local, state and federal level, the first hurdle was overcome in timely fashion. To obtain funding, the Commission floated a \$25 million bond issue that passed on a vote of the people, by an unprecedented 95 percent majority, giving strong indication of the yearning of people in that region for a reliable water supply (figure 39).

Part of the cost of the water treatment plant was borne by grants (\$2.8 million) from DNR and from the U.S. Farmers Home Administration, but by far the largest share (\$21.8 million) was borne by CCWWC customers through the bonding process.

The actual construction of the plant and the initial laying of some 155 miles of distribution pipelines was accomplished in near-record time. In addition, two booster pumping stations and 2.5 million gallons of system storage were built. Bids for construction were opened in September 1990, and the first sale of water to members began on June 16, 1992. Treated water began to flow to 17 cities and rural water districts in a multi-county area who were members of CCWWC at the time.

THE VISION AND REWARD OF STATE WATERPLANNING

There are few situations where state government has delivered such tangible results as those that flow from the Cannon Water Contracts. For the first time in history, a water-stressed part of Missouri has a “bullet-proof” water supply, at a price that will go down as the years go by. A water supply adequate to meet almost any foreseeable need, under control of the state, is available for economic development and/or enhancement of the quality of life, something that few other places in the United States can claim. This has all been possible because of the continuity of state water planning through seven governors, 35 General Assemblies, and uncounted administrators and state employees.

Water, anyone?

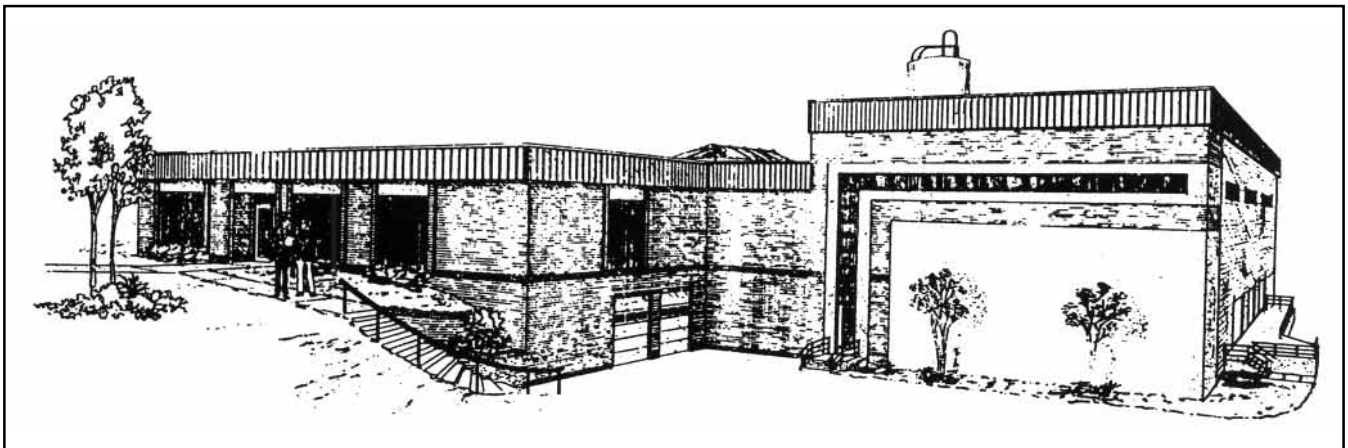


Figure 39. The Clarence Cannon Wholesale Water Commission's Cecil V. Fretwell Water Treatment Plant in Monroe County, Missouri. Drawing from CCWWC's 1995 Annual Report.

SELECTED CURRENT AND FUTURE INTERSTATE WATER ISSUES BY RIVER BASIN

Issues that engage states in dialogue and controversy vary from basin to basin. Some issues are highly contentious, while others are more like continuing irritations or occasional aggravations. Each basin organization addresses the issues that concern its members in an ongoing manner, through the protocols set up by the representatives. For example, Missouri River management has been a topic of deliberation in the Missouri River Basin Association continuously since the organization was formed.

ARKANSAS RIVER BASIN

ISSUE: Water Quality.

BACKGROUND: Over a period of more than a hundred years, underground metal mining for zinc and lead left a legacy of abandoned, water-filled mines that now present a water-quality problem in a three-state area, but primarily in Oklahoma, where some of the mine water now drains.

STATUS: There are no ongoing deliberations in AWRBIAC related to this issue. However, the US EPA has designated Superfund site(s) and has an ongoing program to address the problems.

OUTLOOK: Federal involvement in this issue continues at a relatively low funding level, and is not expected to increase, given the current mood in Washington. Neither Missouri nor Oklahoma considers this to be an urgent problem at this time.

LOWER MISSISSIPPI RIVER BASIN

ISSUE: Gulf Hypoxia Zone.

BACKGROUND: Since the early 1970s, a zone of low oxygen concentration (hypoxia) has developed in the Gulf of Mexico, off the Mississippi River delta. The hypoxia zone can be thought of as the marine analog of the “ozone hole” over Antarctica (figure 40). The hypoxia zone waxes and wanes with the seasons, being most pronounced in the summer. The low oxygen stresses marine life, killing those organisms that cannot swim away from it, and causes fish, shrimp, etc. to avoid it. The cause of the hypoxia is thought to be large amounts of nutrients (nitrogen and phosphorus), the source of which is believed to be primarily from agricultural and urban sources in the states upstream in the Mississippi River basin (Lovejoy, 1992).

STATUS: While the Gulf hypoxia phenomenon has been known to science for years, the public is only beginning to become aware of it. The U.S. Environmental Protection Agency and the State of Louisiana co-sponsored two interstate meetings in late 1995 to draw attention to the problem. The thrust is to develop an awareness of the issue throughout the states that are part of the Mississippi River drainage, and convince their pollution control agencies to take action to reduce the volume of nutrients that enter the river. According to preliminary data developed by federal agencies, including the U.S. Geological Survey and

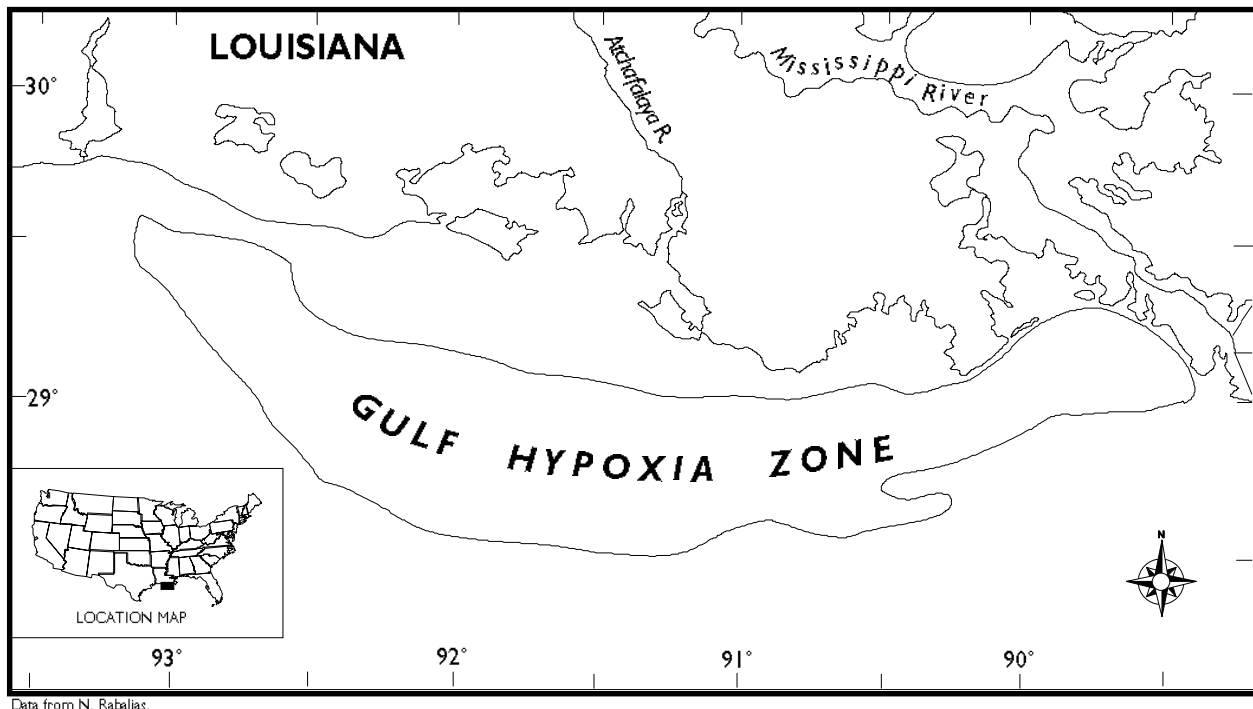


Figure 40. Gulf Hypoxia Zone, thought to be caused by excessive nutrients entering the Gulf of Mexico through the Mississippi River and its distributaries, waxes and wanes with the seasons, becoming most intense during the late summer.

the U.S. EPA, Missouri, with its extensive row-crop agricultural activity and with major population concentrations along the Missouri and Mississippi Rivers, is a significant source of nutrients in the river.

OUTLOOK: Great strides have been made in Missouri to control point-source pollution, as from city sewage treatment facilities and industrial discharges, toward improving water quality in the major rivers. Non-point source pollution abatement, including stormwater control, is not as far advanced, but is expected to show rapid improvement because both the U.S. EPA and the Missouri Division of Environmental Quality have given it high priority. At the same time, agricultural practices are changing toward more narrowly targeted uses and lower application rates of both fertilizers and pesticides, thereby improving crop production and water quality at the same time.

The Department of Natural Resources' Soil and Water Conservation Program, using funding from the one-tenth cent sales tax for soil and water and state parks, has made significant strides in reducing soil erosion, thereby

reducing the nutrient loads that otherwise would accompany eroding soils.

The Parks and Soils Sales Tax has a sunset provision that expires in 1998, but a successful initiative petition campaign put the issue on the ballot and it passed by a wide margin in the November 1996 election.

Looking ahead, crop production forecasts for the first 50 years of the 21st century show a doubling of grain production over current levels, which suggests that more fertilizer is going to be needed. In order to avoid higher nutrient loading in the river, application technology and surface water runoff controls must show dramatic improvements.

ISSUE: Endangered Species.

BACKGROUND: The Endangered Species Act (ESA) brings powerful forces into play when an animal or plant is declared endangered. Industries can be shut down, federal agencies can be forced to carry out costly recovery actions, and private enterprise can be restricted. The thrust of the ESA is to prevent the extinction of species, and it has had some spectacular successes. The U.S. national symbol, the bald eagle, has recov-

ered from the brink of extinction, to the point where the Missouri Department of Conservation holds annual "Eagle Days" for public viewing of the majestic birds in the wild. Bald eagles are now frequently seen in winter months, fishing along the Mississippi and Missouri Rivers, and in the Gasconade and Osage basins.

Nevertheless, the ESA is frequently viewed with fear and trembling, and monumental struggles have developed between the U.S. EPA, the U.S. Fish and Wildlife Service, and various interests who fear a loss of jobs or economic potential related to ESA listings.

The Lower Mississippi River is habitat for the Pallid Sturgeon, a relatively recent ESA listing. So little is known about the life cycle of the fish, however, that it is not clear what restrictions may be placed on the various users of the Lower Mississippi in order to recover the species.

OUTLOOK: The Pallid Sturgeon is a free-ranging species that uses the entire Mississippi River, plus the Missouri, Ohio, and smaller

tributaries of the Mississippi. Therefore, any measures designed to recover the species will likely affect all parts of the river system. The Missouri Department of Conservation is a major player in the recovery plan, and has developed methodology for hatchery production of sturgeon, which are later released into the rivers where they presumably will enhance the species chances for full recovery and delisting. In addition, various habitat projects on both the Mississippi and Missouri Rivers are expected to gradually increase the favorable habitat for the fish, and thereby improve its chances for survivability.

Meanwhile, several other fish species are being considered for ESA listing. At this point, it is not clear whether requirements for additional species will be the same as, or different from, criteria favorable to the Pallid Sturgeon.

ISSUE: Levees.

BACKGROUND: Levees built by the Army Corps of Engineers generally performed well during the Great Flood of '93. Many other

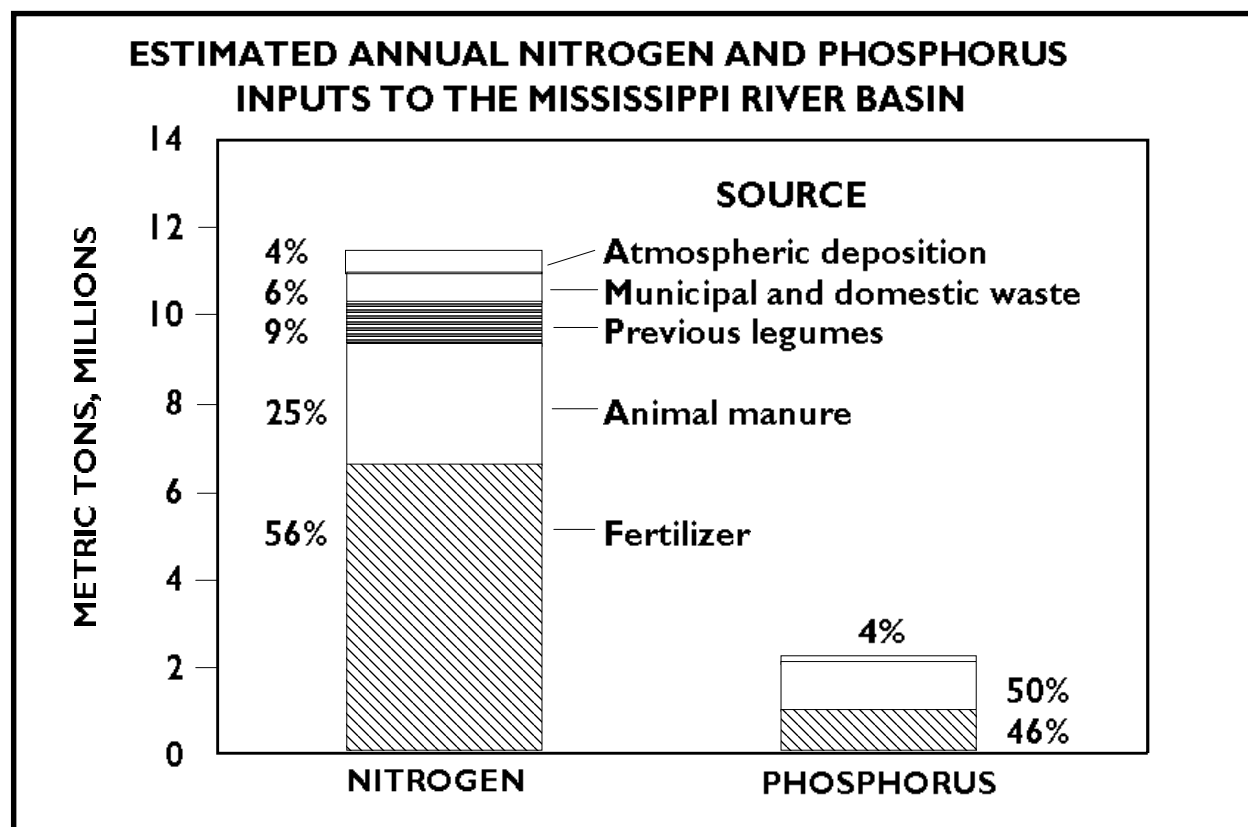


Figure 41. Sources of nitrogen and phosphorous in the Mississippi River, by category. Data obtained by the U.S. Geological Survey, using 1991 nitrogen fertilizer sales, the 1987 Census of Agriculture, and from other sources.

levees built by levee districts and other governmental and quasi-governmental entities did not fare as well. For the most part, this was the result of levees being constructed for floods of magnitudes lower than the Great Flood of '93. The perception is that the levee system protecting the Missouri River and parts of the Upper Mississippi cannot be operated as a unit because of conflicting jurisdictions (figure 42).

STATUS: No current activity.

OUTLOOK: No major changes expected.

MISSOURI RIVER BASIN

ISSUE: Revision of the Master Water Control Manual.

BACKGROUND: Since 1988, when a major drought settled in over the Missouri River Basin, there has been an intense controversy between the states and Indian tribes of the basin, and the Corps of Engineers, over how the river should be managed. The Corps of Engineers operates the system of six main-stem dams that control the river, from the Reservoir

Control Center in Omaha, Nebraska. Since the system became operational in 1954, the Corps' management decisions have been guided by the Missouri River Master Water Control Manual (Master Manual, or MM), which is revised periodically to reflect current conditions.

The Master Manual is designed to guide the Corps in providing the benefits specified in the Water Development Act of 1944, which authorized the construction of the dams and charged the Corps of Engineers with operating the main-stem reservoir system. The legislation further specified the benefits—Flood Control, Navigation, Irrigation, Water Supply, Hydropower, Recreation, and Fish & Wildlife—that the Corps must deliver.

When the drought began in 1988 (it ended with the Great Flood of '93), the Corps began to draw down the water stored in the main-stem reservoirs in order to meet downstream needs, as required by law. However, upstream states objected on the grounds that recreational boating, game-fish spawning, and fishing were adversely impacted by lower lake levels. The Corps responded by beginning

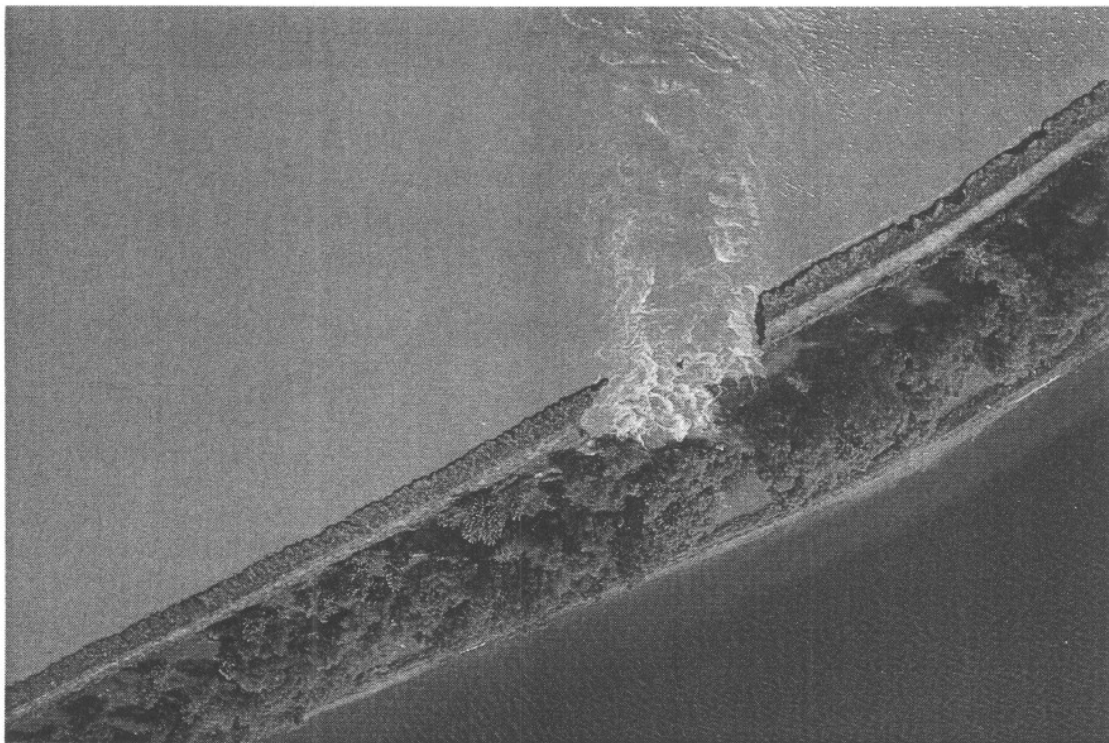


Figure 42. Typical levee break during the Great Flood of '93. Missouri River, St. Charles County, Missouri. Photo by Jerry D. Vineyard.

studies of the river that would lead to a revised Master Manual, presumably reflecting current conditions. In the meantime, the Corps acceded to demands of upstream state politicians by departing from Master Manual requirements and curtailing support for navigation on the channelized reach of the river between Gavins Point Dam near Yankton, South Dakota, and St. Charles, Missouri.

The extensive studies were necessary in order to comply with the National Environmental Policy Act, which requires an Environmental Impact Statement (EIS) before taking any major federal action. A draft EIS (DEIS) was completed in 1994, and there followed a series of 24 public hearings throughout the Missouri River Basin and in cities in the Mississippi River Basin where impacts of Corps actions on the Missouri River would be felt.

Following the public hearings, which generated voluminous oral and written testimony, the Corps admitted shortcomings in its DEIS, and began a series of new studies to provide the data necessary to revise the DEIS.

STATUS: Extensive studies are underway by the Corps of Engineers and its contractors to correct deficiencies in the DEIS. These studies are scheduled for completion in September, 1997, after which the Corps will issue a revised DEIS, and conduct a new series of public hearings to receive comments. Following the hearings, the Corps plans to prepare a final DEIS, and thereafter, a revised Master Manual.

Meanwhile, the states and Indian tribes are holding negotiating sessions to try to reach a compromise solution that all parties can agree on. This effort is moving toward conclusion in fall, 1997.

OUTLOOK: Upstream and downstream interests in the Missouri River are still far apart in reaching agreement on how the river is to be managed in the years ahead. Even if everything works as the Corps projects, the earliest a new Master Manual could be in effect is probably 1998. In the meantime, the existing Master Manual is still in effect, yet the Corps continues to depart from its provisions by curtailing navigation beyond Master Manual requirements. The upstream states are not any

happier; South Dakota resigned from the Missouri River Basin Association, and Governor Janklow has made it clear that he will take whatever action he thinks will be successful in forcing the Corps to change its management strategy to retain more water upstream, and release less water to meet downstream needs.

ISSUE: Indian Water Rights.

BACKGROUND: Some 25 Indian tribes living on reservations in the Missouri River Basin claim rights to water from the Missouri River and its tributaries. The tribes are seeking to adjudicate their rights through compacts with individual states, and eventual ratification by the Congress. A major tribal goal is to gain the right to market water out of basin, for profit. The total volume of Indian Water Rights claims now exceeds the average annual water release from Gavins Point Dam (see p. 4).

STATUS: Congressmen from upstream states have introduced legislation in Congress on three separate occasions, to ratify a compact between two Indian tribes living on reservations in western Montana, with the State of Montana. The compact grants to the tribes the right to market water out of basin, for profit. To date, the effort to obtain Congressional ratification of the compact has not been successful, but some version of the legislation is likely to surface again. Missouri remains unalterably opposed to out-of-basin water marketing for profit, because it has the potential to severely reduce the flow of the Missouri River through Missouri, and to negatively impact the ecosystem all the way to the Gulf of Mexico.

ISSUE: A new vision for the Missouri River.

BACKGROUND: Pending revision of the Master Manual, considerations of the Endangered Species Act, and a profound change in the public attitudes about flood plain management in the aftermath of the Great Flood of '93 set the stage for a new vision for the Missouri River in the 21st century. The channelization of the river through the Bank Stabilization and Navigation Project has long drawn fire from the environmental community, which argues for restoration of fish and wildlife habitat and

enhancement of recreational opportunities. The opportunity is at hand to redesign the river to deliver the benefits we presently enjoy and provide improvements for the future.

STATUS: After the '93 flood, funds became available to acquire flood-damaged lands that could not be restored to agricultural production. Towns and villages that were heavily damaged have either moved to higher ground, or the residents—after buyouts—have simply moved away. Today there are far fewer occupied structures on the floodplain (figure 43).

Moreover, highway and bridge designers are beginning to revise their approach to construction in floodplains. Through the Missouri River Mitigation Project and such other federal programs as the Emergency Wetlands Reserve Program, the Missouri Dept. of Conservation's post-flood recovery initiative, State Emergency Management Agency and Dept. of Economic Development buyout programs financed by the Federal Emergency Management Agency and U.S. Dept. of Housing and Urban Development, flood-damaged lands are becoming the basis for a dramatic restoration of fish & wildlife habitat on the river, without sacrificing commercial navigation.

OUTLOOK: Land acquisition continues, albeit at a pace slower than might have been anticipated, largely because of land title/ownership problems. The Dept. of Conservation has extended its \$6 million partnership land acquisition program to the year 2002. There appears to be a loose coalition of agencies and private organizations that are working toward a more productive Missouri River corridor, that is less vulnerable to flood damage.

UPPER MISSISSIPPI RIVER BASIN

ISSUE: Environmental management program.

BACKGROUND: The Upper Mississippi River Basin has in place a federally-funded Environmental Management Program (EMP) that has achieved notable success (see Table 3, p. 38). Briefly, the EMP develops partnerships between state and federal agencies to acquire and/or restore wildlife habitat along river cor-

ridors. A similar program for the Missouri River is viewed as a way to greatly improve the riverine ecosystem.

STATUS: The Missouri River Basin Association has worked toward setting up an EMP for the Missouri River, either as an addition to the Mississippi River EMP, or a stand-alone program.

OUTLOOK: The current outlook in Congress for funding new programs appears to be bleak, but perhaps not hopeless.

ISSUE: Upper Mississippi Navigation Study.

BACKGROUND: The Corps of Engineers, under the direction of its North-Central Division, is conducting a six-year, \$45 million study to determine what needs to be done to continue and enhance commercial navigation on the Mississippi River. The navigation system is currently operated through a series of 27 locks and dams, beginning in St. Paul, Minnesota and ending just above St. Louis, Missouri. Some of the dams were built in the 1930s and are in need of replacement and/or major rehabilitation. The Corps study now focuses on 14 of these structures—12 on the main-stem Mississippi, and two on the Illinois River—which need 1) replacement; 2) major rehabilitation; and/or 3) additional lock capacity.

To address environmental concerns, the navigation study has environmental components that deal with water quality, fish & wildlife, habitat, and recreational issues. The Corps has set up a Governors' Advisory Committee to coordinate with states on issues that are raised during the study. In addition, the Corps has allocated significant funds for public involvement.

STATUS: The navigation study is well underway, scheduled for completion in 1999, provided budget cutbacks in the Corps of Engineers do not delay its completion. Engineering and economic studies are nearly complete, but environmental studies are not as far along. Quarterly meetings with the Governors Advisory Committee are being held, and public involvement sessions are scheduled periodically.

OUTLOOK: Significant funding problems that threaten to derail the navigation study time-

St. Louis Post-Dispatch

NEWS ANALYSIS

FRIDAY, JANUARY 26, 1996

Public Costs Plummet for 1995 Floods

Buyout Of Property Destroyed in '93 Gets Credit For Savings

By Tim O'Neil

Of the Post-Dispatch Staff

The floods of Spring 1995 cost public treasuries only about 5 percent of the heavy bill rolled up by the record flood in 1993, according to a Missouri agency's report.

The biggest reason for the savings was that the government had bought about 4,000 residential properties that were ruined by the Mississippi and Missouri rivers in the spring and summer of 1993. There wasn't nearly so much valuable property for the floods of 1995 to destroy.

The other reason is that the 1995 flood wasn't quite as bad. The Missouri got within three feet of its August 1993 record at St. Charles, but the Mississippi at St. Louis stayed about seven feet below its historic high. Only in far southern Missouri near the Ohio River, which also flooded in spring 1995, did crests exceed the 1993 levels.

Even before the rivers receded in May, it was obvious the damage was much lower than in 1993.

Reports last week by the Missouri Emergency Management Agency put solid figures to that assumption. The agency says state and federal spending on buyouts, assistance to flooded families, repairs to public works and other costs for 1993 totaled about \$390 million, not counting damage to farmland and crops or flood-insurance claims.

For the May 1995 flood, the figure is \$23.3 million.

"The reason is that the buyout was so effective," said Susie Stonner, agency spokeswoman.

"The same areas flooded in both years. The people weren't there the second time."

Missourians suffered the most property damage among all the Midwestern states during the 1993 flood. The purchase and demolition of 3,963 residential properties cost the state and federal treasuries about \$90 million. In St. Charles County alone, the government bought 1,489 properties, including 450 homes and 809 mobile-home pads.

After last year's flood, the state and federal emergency agencies agreed to buy only 130 residential properties for a total cost of about \$3.6 million. Most of the purchases are in Cape Girardeau and Commerce, a town on the river side of the main levee about 10 miles south of Cape Girardeau.

Commerce's 170 residents have decided to abandon the town. Only two Missouri communities—Rhineland, on the Missouri upriver from Hermann, and Pattonsburg, on the Grand River in northwestern Missouri near Gallatin—have decided to move their towns uphill, as Valmeyer is doing in Illinois south of St. Louis.

Comparisons of other flood-damage factors are equally lopsided. For example, 37,000 Missouri households received \$34.5 million in emergency assistance in 1993 and spring 1994. In 1995, only 4,000 households received \$4.1 million.

And the cost of repairs to such public works as roads, bridges, and water plants: \$127 million in 1993-94 and \$9.5 million last year.

Figure 43. Clipping from St. Louis Post-Dispatch documenting reduced flood losses.

table have arisen in Congress. It is uncertain whether Congress will stay the course and fund the study to completion. If the study is not fully carried out, there is a question whether the work will be adequate for the preparation of an Environmental Impact Statement, required before major federal expenditures can be made to replace or rehabilitate locks and dams. The average cost per structure is likely to be between \$100 and \$500 million.

ISSUE: Environmental Management Program.

BACKGROUND: As part of an agreement enabling the replacement of Lock & Dam 26 at Alton, Illinois, Congress established the Environmental Management Program (EMP), designed to enhance fish and wildlife habitat throughout the Upper Mississippi River corridor. The 20-year program sunsets in the year 2002. To date, 19 projects in Missouri have been completed, are underway, or have been planned for a total of \$19.625 million.

STATUS: Missouri has benefitted to a considerable extent from the EMP, which has improved the outlook for fish and wildlife

resources in the river reach north of St. Louis. However, no projects have been completed on the lower part of the river, between St. Louis and Cairo, Illinois (mouth of the Ohio River).

Looking toward reauthorization of the EMP after the current program sunsets in 2002, the Corps is preparing a Report to Congress that will summarize the achievements of the program and make the case for extending the program beyond 2002.

OUTLOOK: Budget problems have surfaced in the new Congress. The EMP had been funded at the authorization level of \$19.2 million per year, but Corps administrators have been forced to prioritize, with the likely outcome that full funding will not be achieved.

ISSUE: Levees.

BACKGROUND: The Great Flood of '93 focused attention on uncoordinated levee construction in the Upper Mississippi. Levees on both sides of the river are built to different specifications and heights, and maintained by autonomous levee districts. The system was severely stressed in the '93 flood, with many devastating levee breaks. Heroic floodfighting

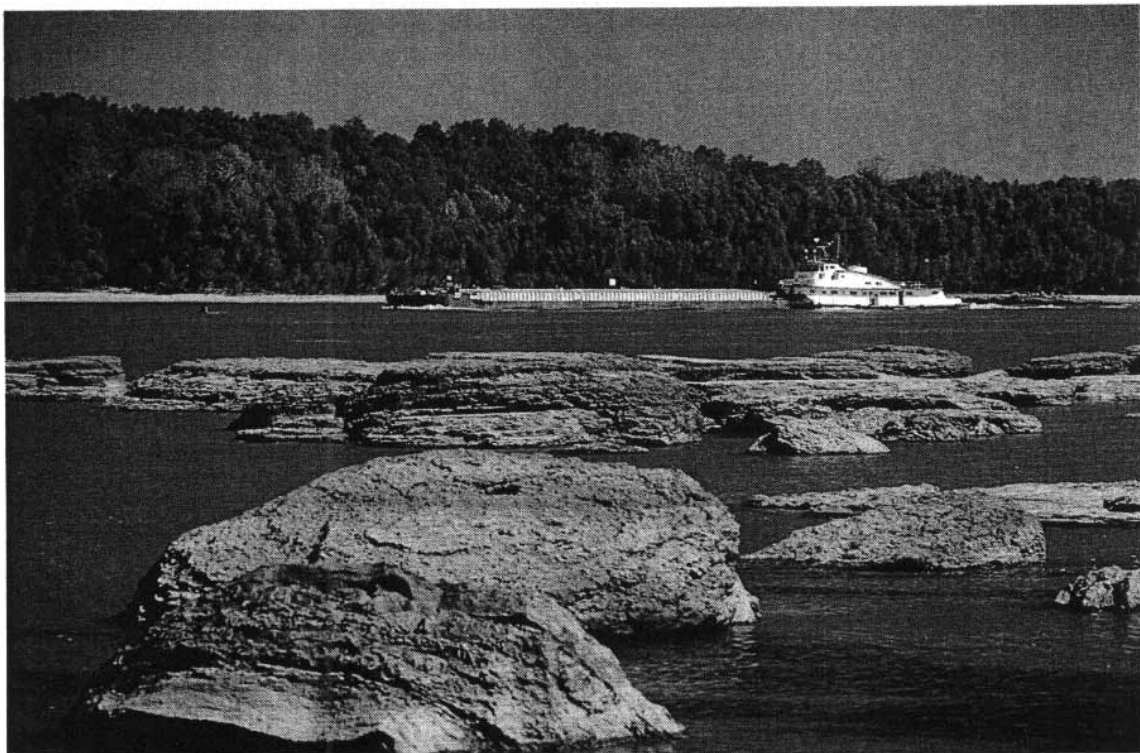


Figure 44. Tow passing Thebes Gap on the Mississippi River below Cape Girardeau, during low water. Photo by Jerry D. Vineyard.

efforts sometimes prevented flooding on one side of the river, only to exacerbate flooding on the other side.

STATUS: Following the Great Flood of '93, the Upper Mississippi River Basin Association developed a Leveed Floodway Agreement signed by all five states. The agreement provides guidelines for levee heights and contains assurances that one state will not build a levee that will cause increased flooding on the opposite side.

OUTLOOK: The Leveed Floodway Agreement was signed in 1995, but it ran into unexpected opposition and the state of Illinois has withdrawn. It is uncertain whether the agreement can be salvaged by renegotiation.

WHITERIVERBASIN

ISSUE: Revised Management Plan.

BACKGROUND: For many years the Little Rock District of the Corps of Engineers, which manages the White River lakes, power-generation dams, flood control and navigation, has been making annual exceptions to its operating plan, to address desires of various constituencies. To eliminate continuing variances, the Corps invited a wide spectrum of governmental agencies and private interest groups to help develop a new operating plan for the river, which would accommodate the needs of farmers, conservationists, the recreation industry, power generation, flood control and navigation in a plan that would not require annual variances. Toward this goal, the advisory group has met periodically with the Corps over the past three years, but agreement has not yet been reached. Missouri has three entities represented on the informal advisory group: the Dept. of Conservation, representing fish and wildlife interests; private individuals from the Clearwater Lake Association, representing recreational interests; and the Dept. of Natural Resources, representing water resource interests.

STATUS: Planning meetings continue on an as-needed basis. Currently, the Corps is working on a new economic model to assist in decision-making on the relative priority of

different uses of the river system.

OUTLOOK: Meetings begin early in 1996 toward completing a new operating strategy for the White River. However, recent budget cutbacks in the Corps leave the Little Rock District with reduced resources to conduct the necessary studies to support informed decision-making. And, the longer the process continues, the more complicated it seems to become. As an example, farmers on the lower White River want water off their croplands in the spring, at the same time fish and wildlife managers want flooding to encourage fish spawning and to simulate the unregulated conditions under which flora and fauna once thrived.

ISSUE: Dissolved oxygen.

BACKGROUND: Low dissolved oxygen in the tailwaters of the four large dams on the White River—Beaver, Bull Shoals, and Norfolk in Arkansas, and Table Rock in Missouri—has been a persistent problem threatening the health of the fisheries in the river, especially that of the Brown trout. The problem worsens in late summer, and is related to power generation releases through the turbines of the generating plants in each dam. To address the problem, an ad hoc committee representing the several interests involved, has been working to develop solutions that will raise oxygen levels to reasonable levels.

STATUS: Several measures have been developed and placed in operation, that have improved the situation somewhat. However, the problem is not considered to be solved, and work continues. Both the Missouri Dept. of Natural Resources and the Dept. of Conservation send representatives to meetings.

OUTLOOK: Recently, representatives of the Tennessee Valley Authority, which has successfully dealt with low oxygen problems involving its dams, have toured the White River dams to see if they can offer helpful advice. Eliminating the low oxygen problems will be highly beneficial to the recreational economy, as well as allowing for continued development of the Brown, Rainbow, and Brook trout fisheries in the White River.

ISSUE: Water Quality.

BACKGROUND: When Table Rock Dam was completed and Table Rock Lake filled, it had remarkably clear water, but over the years water clarity has declined. The reason is thought to be worsening water quality, caused by residential and commercial development around the perimeter of the lake, and by greatly increased boating and recreational activity on the lake.

STATUS: Awareness of the declining water quality in Table Rock Lake, as well as in the other White River lakes, is causing widespread concern. Studies are being conducted to determine the rate of decline and its causes.

OUTLOOK: As concern over lake water quality rises, more emphasis is likely to be placed on arresting the decline and restoring the lakes to better water quality. In Missouri, stronger pollution-abatement measures, phosphorous limits, stormwater control, and new regulations for individual waste-disposal sys-

tems (usually septic tanks) is expected to have a positive impact on reducing nutrient loading in the lakes.

ISSUE: Water supply.

BACKGROUND: The explosive growth of the Branson area in southwestern Missouri has begun to stress available groundwater capacity to meet public water supply needs. Administrators are now beginning to look toward surface water supplies, from sources such as Table Rock Lake and Lake Taneycomo.

STATUS: The public debate over water supply is just beginning.

OUTLOOK: Any significant diversion of White River water for water-supply purposes is likely to trigger negotiations about reallocation of reservoir storage. If this is done, accommodation will have to be reached, not only with the Corps of Engineers, but also with other storage users who will have to relinquish part of their share of the lake storage.

FOR FURTHER READING

Mark Twain's oft-cited "Life on the Mississippi" is a nostalgic look at the Mississippi in the days of the steamboat. Today one must look largely to government documents to find answers to questions about the great rivers. Monumental environmental impact statements, special studies, and topical reports all contribute to the mix of information that is available. The following citations give a general idea of the type of information that can be found by the persistent researcher.

Government documents are usually available at any good library. Ones not at hand can be accessed through interlibrary loan. Some of the older documents may be difficult to find.

GENERAL:

The Great Flood of '93 has become a watermark among floods, and it has resulted in sweeping changes in the way governments respond to such disasters. In the aftermath of the flood, President Clinton appointed a special White House Task Force to study the flood and make recommendations. The results of that effort are presented in the following reports.

Army Corps of Engineers, North Central District, 1994, The Great Flood of 1993, post-flood report, Upper Mississippi and Lower Missouri Rivers, with five appendices:

Appendices A, B, and C: Upper Mississippi River Basin

Appendices D and E: Lower Mississippi River Basin

Army Corps of Engineers, St. Louis District, 1995, FPMA: Flood Plain Management Assessment, Main Report: St. Louis Dist., Corps of Engineers, plus five separately-bound appendices.

Appendix A: Hydraulic Modeling (350 p.)

Appendix B: Evaluation (400 p.)

Appendix C: Environmental (440 p.)

Appendix D: Public Involvement/Inst. Factors (490 p.)

Appendix E: Cultural Resources (90 p.)

What has become known as the "Galloway Report" is the work of the President's task force led by Brigadier General Gerald E. Galloway, who crafted many of its recommendations. The Galloway group also had a Technical Committee, which brought together all available technical information into usable format through space-based technology.

Interagency Floodplain Management Review Committee, 1994, Sharing the challenge: Floodplain management into the 21st century: Executive Office of the President, Floodplain Management Task Force, plus appendices A through K, glossary, and (separate), report of the Scientific Assessment and Strategy Team (SAST).

ARKANSAS-WHITE RIVERS:

The Arkansas-White-Red-Basins Interagency Committee (AWRBIA-C) issues an annual report that summarizes both state and federal

activities within the basins. The 1994-95 edition is the last published; others will be similar.

AWRBIAC, 1995, Annual Report: Arkansas-White-Red Basins Inter-Agency Committee, Oklahoma Water Resources Board, preparer.

MISSISSIPPI RIVER:

The Corps of Engineers conducted a detailed study of the lower Mississippi River, in the course of producing an environmental impact statement. Published in 22 documents, the complete report included the Main report and 22 other documents as listed below):

Army Corps of Engineers, 1975, Lower Mississippi Region Comprehensive Study, Main Report and 22 Appendices:

- Appendix A History of Study**
- Appendix B Economics**
- Appendix C Regional Climatology, Hydrology, and Geology**
- Appendix D Inventory of Facilities**
- Appendix E Flood Problems**
- Appendix F Land Resources**
- Appendix G Related Mineral Resources**
- Appendix H Irrigation**
- Appendix I Agricultural Land Drainage**
- Appendix J Navigation**
- Appendix K M and I Water Supply**
- Appendix L Water Quality and Pollution**
- Appendix M Health Aspects**
- Appendix N Recreation**
- Appendix O Coastal and Estuarine Resources**
- Appendix P Archaeological and Historical Resources**
- Appendix Q Fish and Wildlife**
- Appendix R Power**
- Appendix S Sediment and Erosion**
- Appendix T Plan Formulation**
- Appendix U The Environment**

The Mississippi River Corridor Commission prepared a draft report that describes the resources along a one-county-wide path on both sides of the river from New Orleans to St. Paul. The two volumes of the report carry

different dates; Congress may not appropriate funds for publication of the final documents. The work was done by the Denver Service Center, National Park Service, U.S. Department of Interior.

Draft Mississippi River Corridor Study, Volume 1: Feasibility Report, August 1995, 37 p., illus.

Draft Mississippi River Corridor Study, Volume 2: Inventory of Resources and Significance, August 1995 and September 1995, 145 p., illus.

Maps of the rivers are customarily maintained by the Corps of Engineers. Highly detailed, these maps are used by river pilots to navigate the rivers. In loose-leaf format, the maps show all aids to navigation, plus countless other details. The set of maps for the lower Mississippi is typical. For other comparable maps, see the Corps headquarters for that river.

Army Corps of Engineers, Lower Mississippi Valley Division, St. Louis District, 1994 Flood Control and Navigation Maps of the Mississippi River, Cairo, Illinois to the Gulf of Mexico (Including navigation charts of the Middle Mississippi River below Hannibal, Missouri, and the Gulf Outlet, New Orleans to the Gulf of Mexico): 68 maps, 20 charts, and 19 information sheets, 1994.

The Gulf Hypoxia Zone is thought to be caused primarily by nutrient enrichment from states upriver from Louisiana. The EPA financed a study to determine where the nutrients are coming from. The study covered only 1989, so readers of the following report should bear its limitations in mind.

Lovejoy, 1992, Sources and quantities of nutrients entering the Gulf of Mexico from surface waters of the United States: U.S. Environmental Protection Agency, Gulf of Mexico Program, 49 p., plus 51 pages of appendices.

The Upper Mississippi River Basin Commission prepared a comprehensive study of the river that became the justification for Congressional funding for the establishment of the Environmental Management Program and its

Environmental Technical Center. The report was issued as a main report and 13 Technical Reports, as follows:

Upper Mississippi River Basin Commission, 1981, Comprehensive Master Plan for the Management of Upper Mississippi River System, Main Report plus Technical Reports: Upper Mississippi River Basin Commission (since terminated; Upper Mississippi River Basin Association, St. Paul, Minnesota, replaced it).

Technical Report A: Navigation and Transportation

Technical Report B: Effects of Navigation Capacity Expansion on Railroads

Technical Report C: National Transportation Policy Relationship to Navigation Capacity Expansion

Technical Report D: Environmental Report

Technical Report E: Mitigation and Enhancement Handbook

Technical Report F: Long-Term Resource Monitoring

Technical Report G: Impacts of Navigation on Recreation, Potential Wilderness, and Cultural Resources

Technical Report H: Immediate Impacts of a Second Lock at Locks and Dam 26

Technical Report I: Dredged Material Disposal

Technical Report J: Computerized Analytical Inventory and Analysis Feasibility

Technical Report K: System Objectives

Technical Report L: Institutional Arrangements for System Management

Technical Report M: Evaluation of the Public Participation Program

MISSOURI RIVER:

The definitive study of the Missouri River is the monumental work in some 21 volumes, known as the Draft Environmental Impact Statement (DEIS). The DEIS was completed in 1994, but the final EIS has not been issued, pending further study.

Army Corps of Engineers, Missouri River Division, 1994, Draft Environmental Impact Statement, Missouri River Master Water Control Manual, review and update study: Summary statement plus executive summary, plus 21 separately-bound reports, as follows:

Volume 1: Alternatives Evaluation report

Volume 2: Reservoir Regulation Studies

Volume 3A: Low Flow Studies

Volume 3B: Low Flow Studies, Gavins Point Dam to St. Louis, Missouri

Volume 4: Hydraulic Studies

Volume 5: Aggradation, Degradation and Water Quality Conditions

Volume 6A: Navigation Economics

Volume 6B: Water Supply Economics

Volume 6C: Recreation Economics

Volume 6D: Hydropower, Flood Control and Mississippi River Economics

Volume 6E: Regional Economic Development Impacts

Volume 7A: Reservoir Fisheries

Volume 7B: Reservoir Fisheries Appendix C

Volume 7C: Riverine Fisheries Main Report and App. A

Volume 7D: Riverine Fisheries Apps. B and C

Volume 7E: Riverine Fisheries App. D

Volume 7F: Wetlands and Riparian Main Report and Apps. A and B

Volume 7G: Wetlands and Riparian Apps. C, D, E and F

Volume 7H: Least Tern and Piping Plover, Historic Properties, and Mississippi River Environmental

Volume 8: Economic Impact Models, and Environmental Impact Models

Volume 9: Socioeconomic Studies

Annual Operating Plans (AOPs) are prepared by the Corps of Engineers to guide their operation of the river. They follow the requirements of the Master Manual, and usually appear around the first of the year, in time to guide the Corps through the navigating season. Reviewing AOPs gives a clear answer to the question, "How has Corps management of the river changed over time?"

Army Corps of Engineers, Missouri River Division, 1995, Missouri River main stem reservoirs, summary of actual 1994-1995 operations and operating plan for 1995-1996: U.S. Army Corps of Engineers, Missouri River Division, 116 p., 12 pls., misc. additional data.

The definitive history of the Pick-Sloan plan for the Missouri River tells the fascinating history of the project from beginning to the present, in the words of a Corps of Engineers historian.

Ferrell, John R., 1993, Big dam era: A legislative and institutional history of the Pick-Sloan Missouri Basin program: Missouri River Division, U.S. Army Corps of Engineers, Omaha, Nebraska, 228 p., illus.

The Marmaton River is a typical interstate stream that has been studied by the Corps of Engineers. Their report covers both Kansas and Missouri, and contains information about the Fort Scott authorized project. The report also contains a draft interstate water compact on the Marmaton River.

Army Corps of Engineers, Kansas City District (in cooperation with the Missouri Department of Natural Resources), 1984, Marmaton River data base: U.S. Army Corps of Engineers, Missouri River Division, 36 p., illus., plus 12 p. appendix, and 15 p. Draft Kansas-Missouri Marmaton River Compact.

The Missouri River Basin Commission prepared a Comprehensive, Coordinated Joint Plan (CCJP) for water and related land resources in the Missouri River basin, completed in 1980. Shortly thereafter, the Commission dissolved and the planning effort has been largely forgotten.

Missouri River Basin Commission, 1980, Missouri River Basin water resources management plan, a comprehensive, coordinated joint plan for water and related land resources: Missouri River Basin Commission, Omaha, Nebraska, main report plus Apps. A through H.